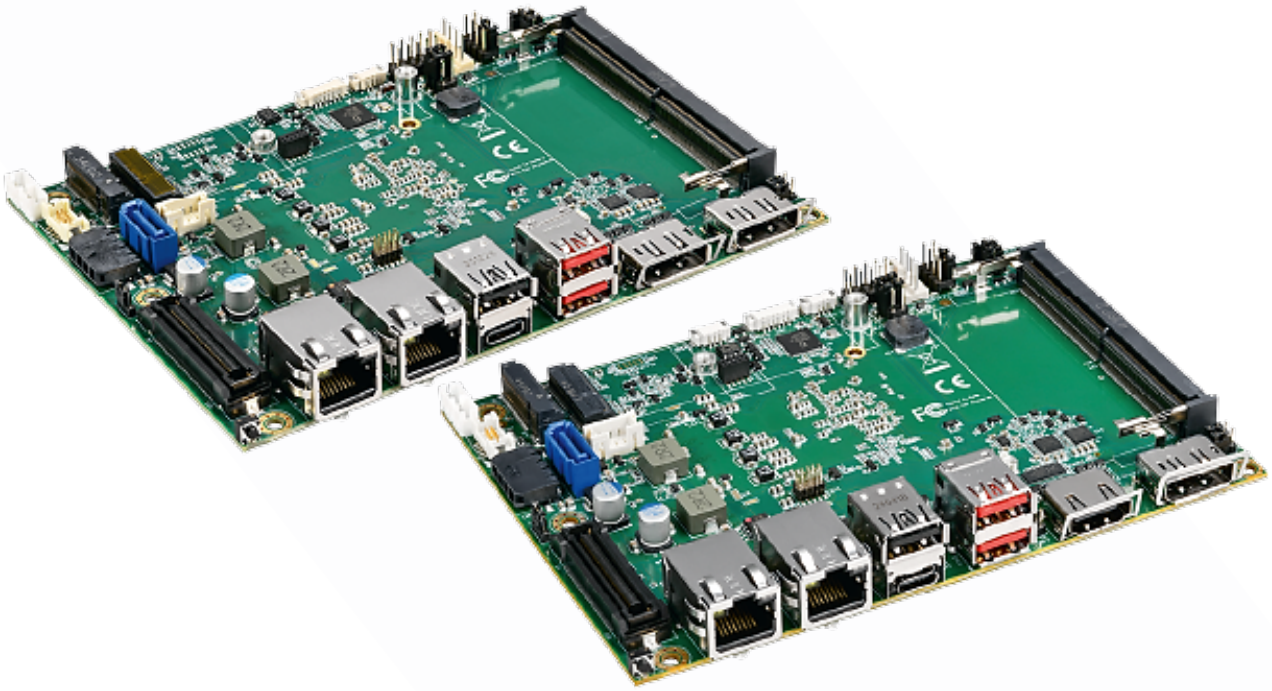
User Guide



3.5"-SBC-AML/ADN/AMH/ADH

User Guide Template Rev. 2.7

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3.5"-SBC-AML/ADN/AMH/ADH – User Guide

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Intended Use

This device and associated software are not designed, manufactured or intended for use or resale for the operation of nuclear facilities, the navigation, control or communication systems for aircraft or other transportation, air traffic control, life support or life sustaining applications, weapons systems, or any other application in a hazardous environment, or requiring fail-safe performance, or in which the failure of products could lead directly to death, personal injury, or severe physical or environmental damage (collectively, “high risk applications”).

You understand and agree that your use of Kontron devices as a component in High Risk Applications is entirely at your risk. To minimize the risks associated with your products and applications, you should provide adequate design and operating safeguards. You are solely responsible for compliance with all legal, regulatory, safety, and security related requirements concerning your products. You are responsible to ensure that your systems (and any Kontron hardware or software components incorporated in your systems) meet all applicable requirements. Unless otherwise stated in the product documentation, the Kontron device is not provided with error-tolerance capabilities and cannot therefore be deemed as being engineered, manufactured or setup to be compliant for implementation or for resale as device in High Risk Applications. All application and safety related information in this document (including application descriptions, suggested safety measures, suggested Kontron products, and other materials) is provided for reference only.

NOTICE	You find the most recent version of the “General Safety Instructions“ online in the download area of this product.

NOTICE	This product is not intended for use or suited for storage or operation in corrosive environments, in particular under exposure to sulfur and chlorine and their compounds. For information on how to harden electronics and mechanics against these stress conditions, contact Kontron Support.

Revision History

Revision	Brief Description of Changes	Date of Issue	Author
1.0	Initial Issue	2024-Dec-25	YS
1.1	Update CN17 mating connector	2025-Feb-03	YS
1.2	Add EMC compliance standards	2025-Mar-21	YS
1.3	Update COM1 & COM2 pin definition	2025-May-28	YS
1.4	Add UR / CSA compliance standards	2025-Jun-11	YS
2.0	Add 3.5”-SBC-AMH/ADH	2025-Jun-26	YS
2.1	Modify power consumption	2025-Aug-05	YS
2.2	Revise power consumption table	2025-Aug-15	YS
2.3	New user Guide template. New chapters- Technical Support, Storage and Transportation, Warranty, Disposal and Cyber security. Included the statement of memory volatility.	2025-Nov-14	YS/CW
2.4	Correct typo of B2B connector pin description (pin 31 & 32)	2026-Feb-25	YS
2.5	Simplify LAN port pin signal description	2026-Mar-10	YS
2.6	Update eDP resolution & Change DIO to GPIO	2026-May-08	YS
2.7	Add Intel® N150	2026-May-20	YS

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Kontron sells products worldwide and declares regional General Terms & Conditions of Sale, and Purchase Order Terms & Conditions. Visit www.kontron.com/terms-and-conditions.
For contact information, refer to the corporate offices contact information on the last page of this user guide or visit our website CONTACT US.

Customer Support

Find Kontron contacts by visiting www.kontron.com/support-and-services.

Customer Service

As a trusted technology innovator and global solutions provider, Kontron extends its embedded market strengths into a services portfolio allowing companies to break the barriers of traditional product lifecycles. Proven product expertise coupled with collaborative and highly-experienced support enables Kontron to provide exceptional peace of mind to build and maintain successful products.
For more details on Kontron’s service offerings such as: enhanced repair services, extended warranty, Kontron training academy, and more visit www.kontron.com/support-and-services.

Customer Comments

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

Symbols

The following symbols may be used in this user guide

⚠DANGER	**DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠WARNING	**WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	**CAUTION** indicates a hazardous situation which, if not avoided, may result in minor or moderate injury **ATTENTION** indique une situation dangereuse qui, si elle n'est pas évitée, peut entraîner des blessures mineures ou modérées.
NOTICE	**NOTICE** indicates a property damage message.
	**Electric Shock!** This symbol and title indicate hazards due to electrical shocks (> 60 V) when touching products or parts of products. Failure to observe the precautions indicated and/or prescribed by the law may endanger your life/health and/or result in damage to your material.
	**ESD Sensitive Device!** This symbol and title indicate that the electronic boards and their components are sensitive to static electricity. Care must be taken during all handling operations and inspections of this product to always ensure product integrity.
	**Caution: HOT Surface!** This symbol and title indicate a hot surface that must not be touched until cool. **Attention : Surface CHAUDE !** Ce symbole et ce titre indiquent une surface chaude qui ne doit pas être touchée avant d'avoir refroidi.
	**Caution: Laser!** This symbol and title indicate the risk of exposure to laser beam and light emitting devices (LEDs) from an electrical device. Eye protection per manufacturer notice shall review before servicing.
	**Caution: High Sound Pressure!** This symbol and title indicate that high sound pressure is possible with headphones. There is a risk of hearing damage. Do not listen at high volume levels for long periods of time.

Security

This symbol and title indicate general information and guidelines regarding the product's cyber security to ensure secure installation, operation, maintenance and disposal of the product within the user's end environment.

This symbol indicates information about the product and the user guide.

This symbol precedes helpful hints and tips for daily use.

For Your Safety

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

High Voltage Safety Instructions

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

⚠CAUTION

Warning

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

⚠CAUTION

Electric Shock!

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

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

Special Handling and Unpacking Instruction

NOTICE

ESD Sensitive Device!

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

⚠CAUTION

Handling and operation of the product is permitted only for skilled personnel within a workplace that is access controlled. Follow the "General Safety Instructions" supplied with the product.

Do not handle this product out of the product's protective enclosure while the product is not used for operational purposes unless the product is otherwise protected.
Whenever possible, unpack or pack this product only at an EOS/ESD safe workplace. Where a safe workplace is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.
It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the product is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the product.

Lithium Battery Precautions

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

⚠CAUTION	Risk of Explosion if the lithium Battery is replaced by an incorrect Type. Dispose of used lithium batteries according to the instructions. Risque d'explosion si la pile au lithium est remplacée par une pile de type incorrect. Éliminez les piles au lithium usagées conformément aux instructions.

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 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 considered.

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 the product as delivered.

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

Quality and Environmental Management

Kontron aims to deliver reliable high-end products designed and built for quality, and aims to comply with environmental laws, regulations, and other environmentally oriented requirements. For more information regarding Kontron's quality and environmental responsibilities, visit Quality | Kontron and Material Compliance | Kontron.

Table of Contents

List of Tables

List of Figures

1/Introduction

This user guide describes the 3.5"-SBC-AML/ADN/AMH/ADH board made by Kontron. This board will also be denoted 3.5"-SBC-AML/ADN/AMH/ADH within this user guide.

Use of this user guide implies a basic knowledge of PC-AT hardware and software. This user guide focuses on describing the 3.5"-SBC-AML/ADN/AMH/ADH 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 carried out automatically or manually by the user via the BIOS setup menus.

Latest revision of this user guide, datasheet, thermal simulations, BIOS, drivers, BSP's (Board Support Packages), mechanical drawings (2D and 3D) can be downloaded from Kontron's Web Page.

2/Installation Procedures

NOTICE

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

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

NOTICE

Turn off PSU (Power Supply Unit) completely (no mains power connected to the PSU) or leave the Power Connectors unconnected while configuring the board. Otherwise, components (RAM, LAN cards etc.) might get damaged. Make sure the DC single supply used is within the range between 9 V and 36 V with suitable cable kit and PS-ON# active.

NOTICE

The power supply unit shall comply with the requirements as defined in IEC 62368-1 according to Clause 6.2.2 to power source category PS2 "Limited Power Source".

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

1. Turn off the PSU (Power Supply Unit)
2. Insert the DDR5 4800 module
   Be careful to push the memory module in the slot before locking the tabs.
3. Connecting interfaces
   Insert all external cables for hard disk, keyboard etc. A monitor must be connected in order to change BIOS settings.
4. Connect and turn on PSU
   Connect PSU to the board by the 3.0 mm pitch 1x4-pin wafer connector.
5. BIOS setup
   Enter the BIOS setup by pressing the <DEL> key during boot up.
   Enter "Exit Menu" and Load Setup Defaults.

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

6. Mounting the board in chassis

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

NOTICE

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

2.1. Chassis Safety Standards

Before installing the 3.5"-SBC-AML/ADN/AMH/ADH in the chassis, users must evaluate the end product to ensure compliance with the requirements of the IEC 62368-1 safety standard:

- The board must be installed in a suitable mechanical, electrical and fire enclosure.
- The system, in its enclosure, must be evaluated for temperature and airflow considerations.
- The board must be powered by a CSA or UL approved power supply that limits the maximum input current.
- For interfaces having a power pin such as external power or fan, ensure that the connectors and wires are suitably rated. All connections from and to the product shall be with SELV circuits only.
- Wires have suitable rating to withstand the maximum available power.
- The peripheral device enclosure fulfils the IEC 62368-1 fire protecting requirements.

2.2. Lithium Battery Replacement

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

⚠CAUTION

Danger of explosion if the lithium battery is incorrectly replaced.

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

VORSICHT! Explosionsgefahr bei unsachgemäßem Austausch der Batterie.

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

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

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

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

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

ADVARSEL! Lithiumbatteri – Eksplosionsfare ved fejlagtig håndtering.

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

ADVARSEL! Eksplosjonsfare ved feilaktig skifte av batteri.

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

VARNING! Explosionsfara vid felaktigt batteribyte.

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

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

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

3/System Specification

3.1. System Block Diagram

Figure 1: System Block Diagram 3.5"-SBC-AML/ADN

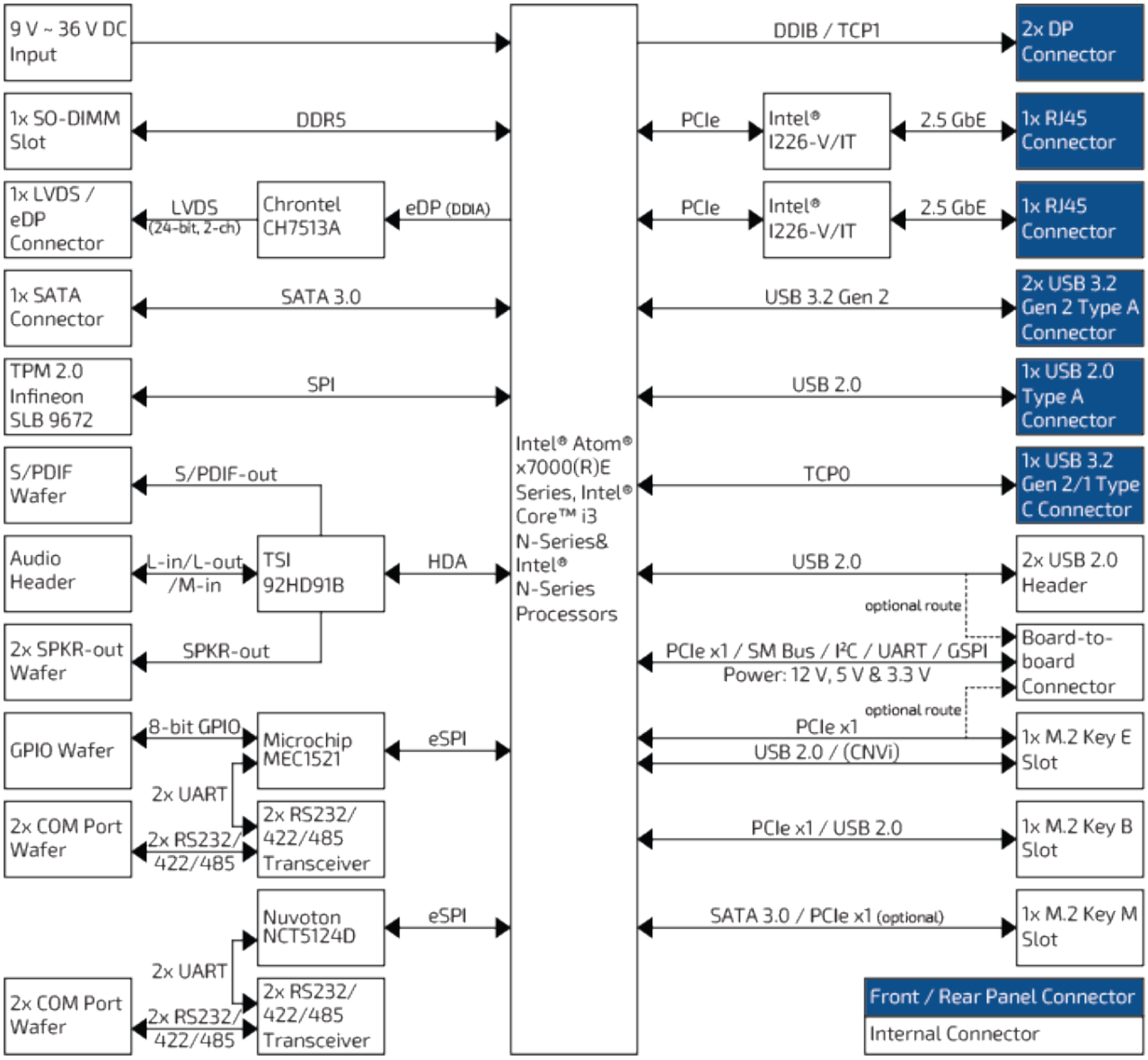
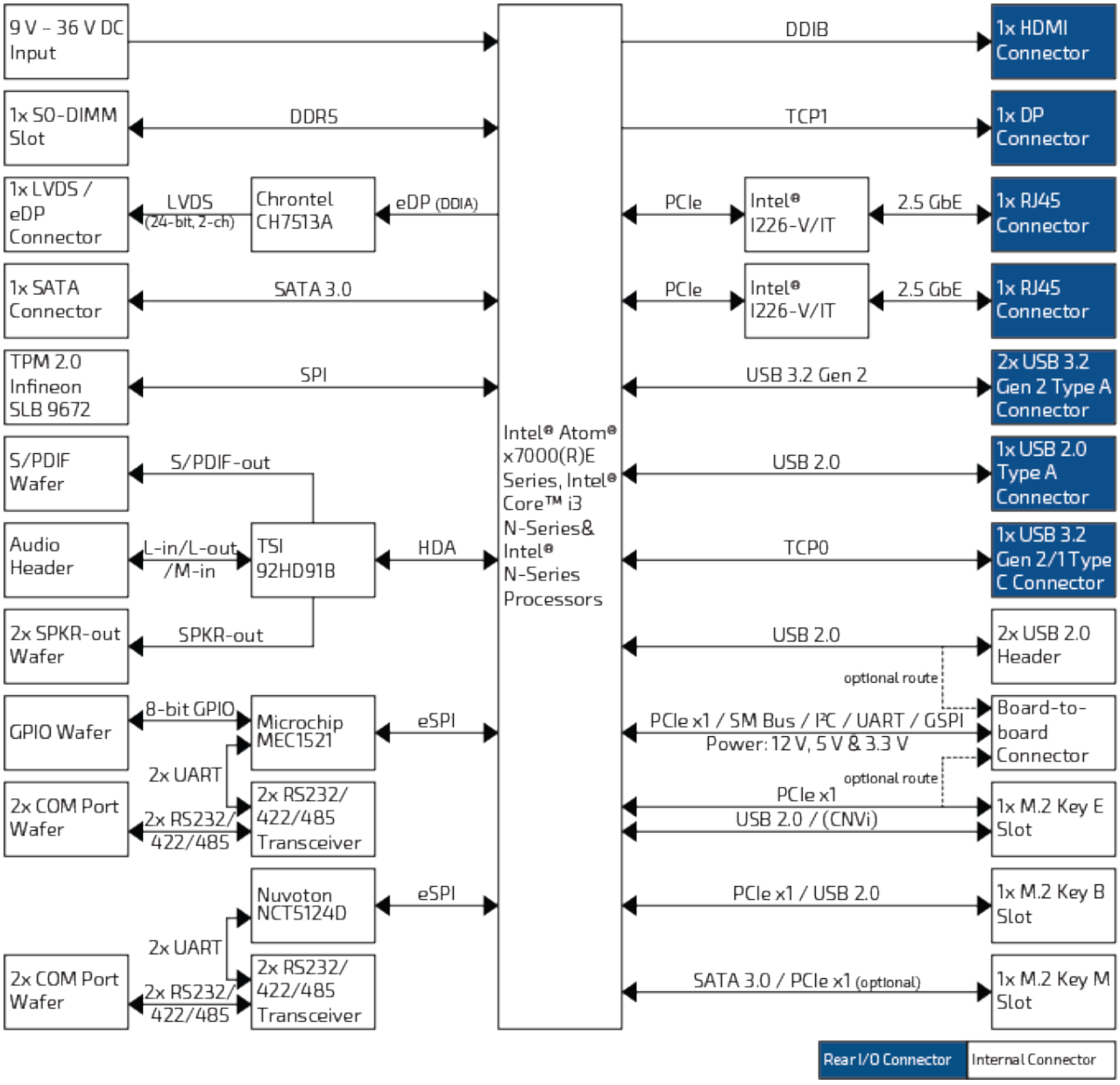


Figure 2: System Block Diagram 3.5"-SBC-AMH/ADH



3.2. Component Main Data

The table below summarizes the features of the 3.5"-SBC-AML/ADN/AMH/ADH single board computer.

Table 1: Component Main Data

	3.5”-SBC-AML/ADN	3.5”-SBC-AMH/ADH
System		
Processor	Intel® Atom® x7000RE Series Processors Intel® Atom® x7000E Series Processors Intel® Core™ i3 N-Series Processors Intel® N-Series Processors	
Memory	1x DDR5 SO-DIMM	
Video		
Display Interface	1x LVDS / eDP (24-bit, 2-ch, 1920 x 1200 @ 60 Hz / 2-lane, 1920 x 1200 @ 60 Hz) 3x DP (4096 x 2160 @ 60 Hz, 2x Standard DP on rear, 1x DP USB-C on rear)	1x LVDS / eDP (24-bit, 2-ch, 1920 x 1200 @ 60 Hz / 2-lane, 1920 x 1200 @ 60 Hz) 2x DP (4096 x 2160 @ 60 Hz, 1x Standard DP on rear, 1x DP USB-C on rear) 1x HDMI 2.0 (4096 x 2160 @ 60 Hz, HDMI Type A on rear)
Multiple Display	Triple	
Audio		
Audio Codec	TSI 92HD91B	
Audio Display	1x Speaker-out (Stereo, 3 W, by header) 1x Line-in (by header) 1x Line-out (by header) 1x Mic-in (by header) 1x S/PDIF Out (by header)	
Network Connection		
Ethernet	2x 2.5 GbE LAN (RJ45 on rear, Intel® I226-V/IT, with TSN for models with Atom® CPUs)	
Peripheral Connection		
USB	2x USB 3.2 Gen 2 Type A (on rear) 1x USB 3.2 Gen 2 Type C (on rear, w/ DP & PD 5 V / 3 A, except Atom® x7000RE) 1x USB 3.2 Gen 1 Type C (on rear, w/ DP & PD 5 V / 3 A, only Atom® x7000RE) 3x USB 2.0 (1x Type A on rear, 2x by header (optl. routed to board-to-board connector))	
Serial Port	4x RS232/422/485 (2x Tx/Rx only in RS232 signal, by header)	
GPIO	8x GPIO (by wafer)	
Storage & Expansion		
SATA	1x SATA 3.0	
M.2	1x M.2 Key B (Type 2242 / 3042 / 3052 / 2280, w/ PCIe x1 / USB 2.0 / UIM) 1x M.2 Key E (Type 2230, w/ PCIe x1 (optl. routed to B2B) / USB 2.0 / UART / PCM / CNVi (Atom® x7000RE does not support CNVi)) 1x M.2 Key M (Type 2280, w/ SATA 3.0 (default) / PCIe x1 (optional))	
SIM Card Holder	1x SIM Card Holder (by header)	
Extended Board-to-board Connector	1x PCIe x1 (default) / 2x PCIe x1 (optional, 1x replacing PCIe in M.2 Key E) 1x SM Bus	

	1x I^2C 1x UART 1x GSPI 2x USB 2.0 (optional, replacing the route to 2x internal USB 2.0)
Power	
Input Voltage	DC 9 V ~ 36 V
Connector	1x4-pin pitch 3.0 mm Wafer
Firmware	
BIOS	AMI uEFI BIOS w/ 256 Mb SPI Flash
Watchdog	Programmable WDT to generate system reset event
H/W Monitor	Voltages Temperatures
Real Time Clock	Processor integrated RTC
Security	TPM 2.0 (Infineon SLB 9672)
System Control & Monitoring	
Button, Switch & Indicator	1x Power Button (on rear) 1x Power LED (Green, on rear) 1x Standby LED (Yellow, on rear) 1x Internal Buzzer
Front Panel Header	1x Header Reset Button, M.2 Key M LED & External Buzzer 1x Header for Power Button, Power LED & SM bus 2x Header for 2.5 GbE LAN LED
Cooling	
FAN	1x Wafer for Smart Fan
Software	
OS Support	Windows 11 Windows 10 Linux
Mechanical	
Dimension (L x W)	ECX (146 mm x 105 mm / 5.75" x 4.13")

3.3. Environmental Conditions

The 3.5"-SBC-AML/ADN/AMH/ADH is compliant with the following environmental conditions. It is the customer's responsibility to provide sufficient airflow around each of the components to keep them within the allowed temperature range.

Table 2: Environmental Conditions

Environmental	Description
Operating Temperature	0 °C ~ 60 °C / 32 °F ~ 140 °F (Standard) -40 °C ~ 85 °C / -40 °F ~ 185 °F (Extreme)
Storage Temperature	-20 °C ~ 80 °C / -4 °F ~ 176 °F (Standard) -55 °C ~ 85 °C / -67 °F ~ 185 °F (Extreme)
Humidity	0 % ~ 95 %

3.4. Compliance

The 3.5"-SBC-AML/ADN/AMH/ADH meets the following standards and certification tests.

If the product is modified, the prerequisites for specific approvals may no longer apply.

Table 3: Standards and Certifications

Compliance	Description
CE Class B **UKCA Class B**	EN 55032: 2015 + A11: 2020, Class B BS EN 55032: 2015 + A11: 2020 CISPR 32: 2015 + COR1: 2016 EN 55032: 2015 + A1: 2020, Class B BS EN 55032: 2015 + A1: 2020 CISPR 32: 2015 + A1: 2019 EN 61000-3-2: 2014 EN IEC 61000-3-2: 2019 + A1: 2021 EN 61000-3-3: 2013 + A2: 2021 BS EN 61000-3-2:2014 BS EN IEC 61000-3-2: 2019 + A1: 2021 BS EN 61000-3-3: 2013 + A2: 2021 EN 55035: 2017 + A11: 2020 BS EN 55035: 2017 + A11: 2020 IEC 61000-4-2: 2008 IEC 61000-4-3: 2020 IEC 61000-4-4: 2012 IEC 61000-4-5: 2014 + A1: 2017 IEC 61000-4-6: 2023 IEC 61000-4-8: 2009 IEC 61000-4-11: 2020 + COR2: 2022 EN IEC 61000-6-2: 2019 EN IEC 61000-6-4: 2019

Compliance	Description
FCC Class B **ICES Class B**	FCC CFR Title 47 Part 15 Subpart B, Class B ICES-003 Issue 7: 2020 Class B ANSI C63.4: 2014 ANSI C63.4a: 2017
UR (UL Recognized) **CSA** (only 3.5”-SBC-AML/ADN)	UL 62368-1, 3rd Ed. CSA C22.2 No. 62368-1:19, 3rd Ed.

3.5. Processor Support

The 3.5"-SBC-AML/ADN/AMH/ADH is designed to support Intel® Atom® x7000RE Series, Intel® Atom® x7000E Series, Intel® Core™ i3 N-Series and Intel® N-Series Processors. The BGA CPU is remounted from factory. Kontron has defined the CPU SKUs as listed in the following table for either standard or project-based board versions, so far all based on Embedded CPUs. Other CPU SKUs are expected at a later date.

Table 4: Processor Support

Name	Core #	Speed (GHz)	Turbo (GHz)	Embedd.	Cache	Socket	TDP (W)	TDP-down (W)	Tj (°C)
Intel® Atom® x7211RE	2	1.0	3.2	Yes	6M	FCBGA1264	6	-	105
Intel® Atom® x7213RE	2	2.0	3.4	Yes	6M	FCBGA1264	9	-	105
Intel® Atom® x7433RE	4	1.5	3.4	Yes	6M	FCBGA1264	9	-	105
Intel® Atom® x7835RE	8	1.3	3.6	Yes	6M	FCBGA1264	12	-	105
Intel® Atom® x7211E	2	1.0	3.2	Yes	6M	FCBGA1264	6	-	105
Intel® Atom® x7213E	2	1.7	3.2	Yes	6M	FCBGA1264	10	-	105
Intel® Atom® x7425E	4	1.5	3.4	Yes	6M	FCBGA1264	12	-	105
Intel® Core™ i3-N305	8	1.8	3.8	Yes	6M	FCBGA1264	15	9	105
Intel® N50	2	1.0	3.4	Yes	6M	FCBGA1264	6	-	105
Intel® N97	4	2.0	3.6	Yes	6M	FCBGA1264	12	-	105
Intel® N200	4	1.0	3.7	Yes	6M	FCBGA1264	6	-	105
Intel® N150	4	0.8	3.6	Yes	6M	FCBGA1264	6	-	105

Sufficient cooling must be applied to the CPU in order to remove the effect as listed as TDP (Thermal Design Power) in above table. The sufficient cooling is also depending on the worst case maximum ambient operating temperature and the actual worst case load of processor.

3.6. System Memory Support

The 3.5"-SBC-AML/ADN/AMH/ADH has one DDR5 SO-DIMM sockets.

The socket supports the following memory features:

- 1x DDR5 SO-DIMM 262-pin
- Single-channel with 1x SO-DIMM per channel
- Up to 16 GB
- SPD timing supported

› In-band ECC supported

The installed DDR5 SO-DIMM should support the Serial Presence Detect (SPD) data structure. This allows the BIOS to read and configure the memory controller for optimal performance. If non-SPD memory is used, the BIOS will attempt to configure the memory settings, but performance and reliability may be impacted, or the board may not be able to boot totally.

3.7. Memory Operating Frequencies

In all modes, the frequency of system memory is the lowest frequency of the memory module placed in the system. The memory module's frequency can be determined through the SPD register on the memory module.
The table below lists the resulting operating memory frequencies based on the combination of SO-DIMM and processor.

Table 5: Memory Operating Frequencies

SO-DIMM Type	Module Name	Memory Data Transfer (MT/s)	Processor System Bus Frequency (MHz)	Resulting Memory Clock Frequency (MHz)	Peak Transfer Rate (MB/s)
DDR5 4800	PC5-38400	4800	2400	300	38400

The memory module has in general a much lower longevity than the embedded motherboard, and therefore EOL of the module can be expected several times during lifetime of the motherboard.

As a minimum it is recommend using Kontron memory module 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 for a minimum of 24 hours.

3.8. On-board Graphics Subsystem

The 3.5"-SBC-AML/ADN/AMH/ADH supports Intel® UHD Graphics Gen12 technology for high quality graphics capabilities. All 3.5"-SBC-AML/ADN/AMH/ADH versions support triple displays pipes.

Triple displays can be used simultaneously and be used to implement independent or cloned display configuration.

The 3.5"-SBC-AML/ADN/AMH/ADH itself provides one internal LVDS / eDP combo interface. The 3.5"-SBC-AML/ADN has two external full-szie DisplayPort connectors and one external DisplayPort over USB Type C connector, while the 3.5"-SBC-AMH/ADH has one external HDMI 2.0 connector, one external full-size DisplayPort connector and one external DisplayPort over USB Type C connector.

Table 6: Triple-displays Configurations 3.5”-SBC-AML/ADN

Display 1	Display 2	Display 3	Max. Resolution (Px) at 60 Hz		
			Display 1	Display 2	Display 3
LVDS	DP	DP	1920 x 1200	4096 x 2160	4096 x 2160
eDP	DP	DP	1920 x 1200	4096 x 2160	4096 x 2160
LVDS	DP	DP USB-C	1920 x 1200	4096 x 2160	4096 x 2160
eDP	DP	DP USB-C	1920 x 1200	4096 x 2160	4096 x 2160
DP	DP	DP USB-C	4096 x 2160	4096 x 2160	4096 x 2160

Table 7: Triple-displays Configurations 3.5”-SBC-AMH/ADH

Display 1	Display 2	Display 3	Max. Resolution (Px) at 60 Hz		
			Display 1	Display 2	Display 3
LVDS	HDMI	DP	1920 x 1200	4096 x 2160	4096 x 2160
eDP	HDMI	DP	1920 x 1200	4096 x 2160	4096 x 2160
LVDS	DP	DP USB-C	1920 x 1200	4096 x 2160	4096 x 2160
eDP	DP	DP USB-C	1920 x 1200	4096 x 2160	4096 x 2160
LVDS	HDMI	DP USB-C	1920 x 1200	4096 x 2160	4096 x 2160
eDP	HDMI	DP USB-C	1920 x 1200	4096 x 2160	4096 x 2160
HDMI	DP	DP USB-C	4096 x 2160	4096 x 2160	4096 x 2160

3.9. Power Input Voltage

In order to ensure safe operation of the board, the input power must monitor the input voltage and shut down if the voltage is out of range – refer to the actual input power specification. Please note, in order to keep the power consumption to a minimal level, boards do not implement a guaranteed minimum load. The 3.5"-SBC-AML/ADN/AMH/ADH board must be powered by a single DC input power within the range between 9 V and 36 V applied through the 3.0 mm pitch 1x4-pin wafer connector CN9 (see Chapter 7.1.1).

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

The input voltages applied at the power input connector are required as follows:

Table 8: Power Input Voltages

Power Input	Min.	Max.	Note
9 V ~ 36 V	8.55 V	37.8 V	Should be ±5 % tolerance

3.10. Power Consumption

The power consumption is measured under the following software and hardware test condition:

- 3.5"-SBC-AML/ADN/AMH/ADH with Intel® Atom® x7835RE processor (Octa Core @ 3.6 GHz)
- Memory: 1x 8 GByte TEAMGROUP DDR5 5600 RAM
- Storage: 128 GByte Phison M.2 SATA SSD
- Operating System: Windows 11 IoT LTSC 24H2

The power consumption in different modes is as follows:

Table 9: Power Consumption

Power Status	Input Voltage	Power Consumption
Boot (Peak)	+36 V	68.76 W
	+9 V	42.21 W
Idle (S0)	+36 V	7.06 W
	+9 V	8.66 W
Full Run (S0)	+36 V	19.84 W
	+9 V	17.82 W

Power Status	Input Voltage	Power Consumption
Sleep (S3)	+36 V	2.09 W
	+9 V	2.04 W
Shutdown (S4 / S5)	+36 V	2.02 W
	+9 V	2.02 W
Shutdown (PSM)	+36 V	108 mW
	+9 V	36 mW

4/Connector Locations

4.1. Top Side

Figure 3: Top Side

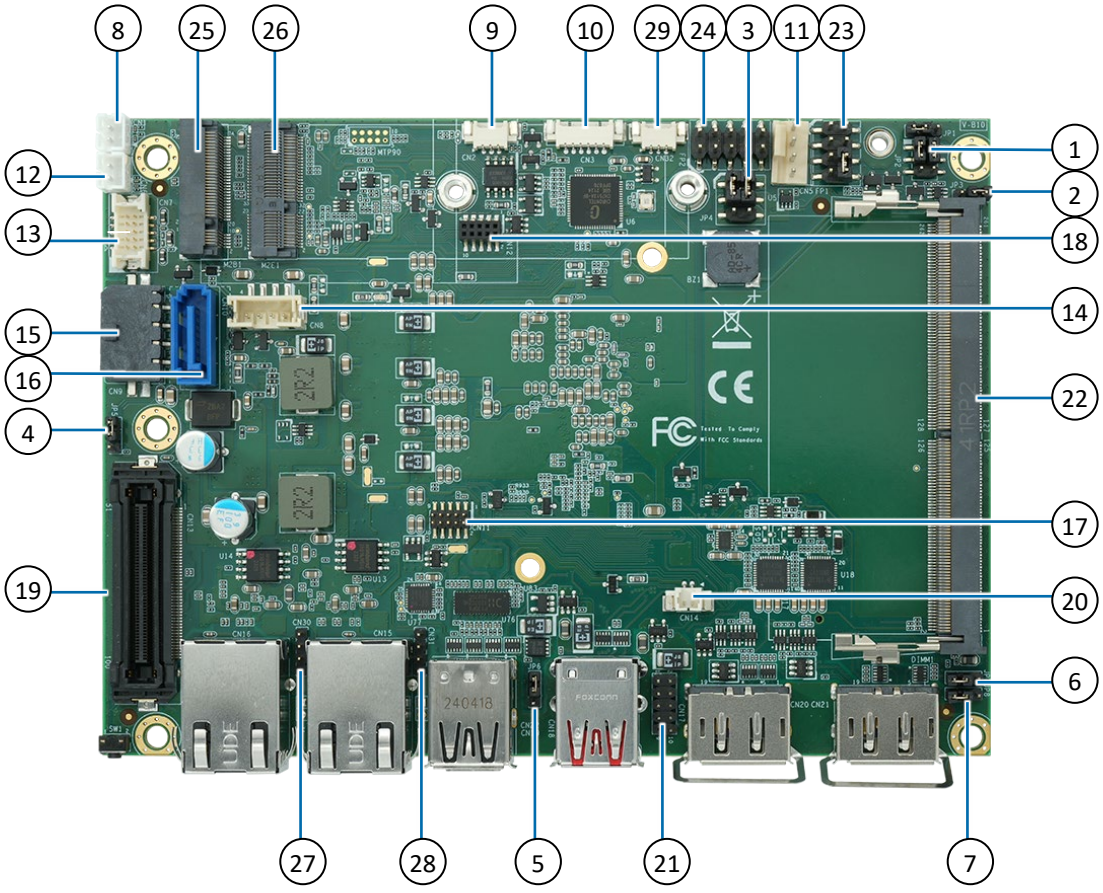


Table 10: Jumper List

Item	Designation	Description	See Chapter
1	JP2	LVDS / eDP Backlight Enable Selection	7.22.1
2	JP3	AT / ATX Power Mode Selection	7.22.2
3	JP4	LVDS / eDP Backlight Power & Panel Power Selection	7.22.3
4	JP5	Onboard DC-DC 12 V Selection	7.22.4
5	JP6	USB Power Selection	7.22.5
6	JP7	Flash Descriptor Security Override Selection	7.22.6
7	JP8	Clear CMOS Selection	7.22.7

Table 11: Top Side Internal Connector Pin Assignment

Item	Designation	Description	See Chapter
8	CN1	Left Channel Audio AMP Output Wafer	7.6
9	CN2	S/PDIF Output Wafer	7.8
10	CN3	SIM Card Wafer for M.2 Key B	7.19
11	CN5	FAN Wafer	7.2
12	CN6	Right Channel Audio AMP Output Wafer	7.6
13	CN7	Audio Input / Output Header	7.7
14	CN8	SATA Power Output Wafer	7.4
15	CN9	DC Power Input Wafer	7.1.1
16	CN10	SATA Connector	7.3
17	CN11	SPI 10-Pins Header	7.15
18	CN12	P80 Holder	-
19	CN13	Board-to-board Connector	7.21
20	CN14	RTC Power Input Wafer	7.1.2
21	CN17	USB 2.0 Port 3 & 4 Header	7.5
22	DIMM1	DDR5 Channel 1 SO-DIMM Slot	3.6
23	FP1	Front Panel Header 1	7.9
24	FP2	Front Panel Header 2	7.9
25	M2B1	M.2 Key B 2242 / 3042 / 3052 / 2280 Slot	7.16
26	M2E1	M.2 Key E 2230 Slot	7.17
27	CN30	2.5 GbE LAN1 LED Header	7.20
28	CN31	2.5 GbE LAN2 LED Header	7.20
29	CN32	LVDS / eDP Backlight Brightness Wafer	7.13

4.2. Rear Side

Figure 4: Rear Side

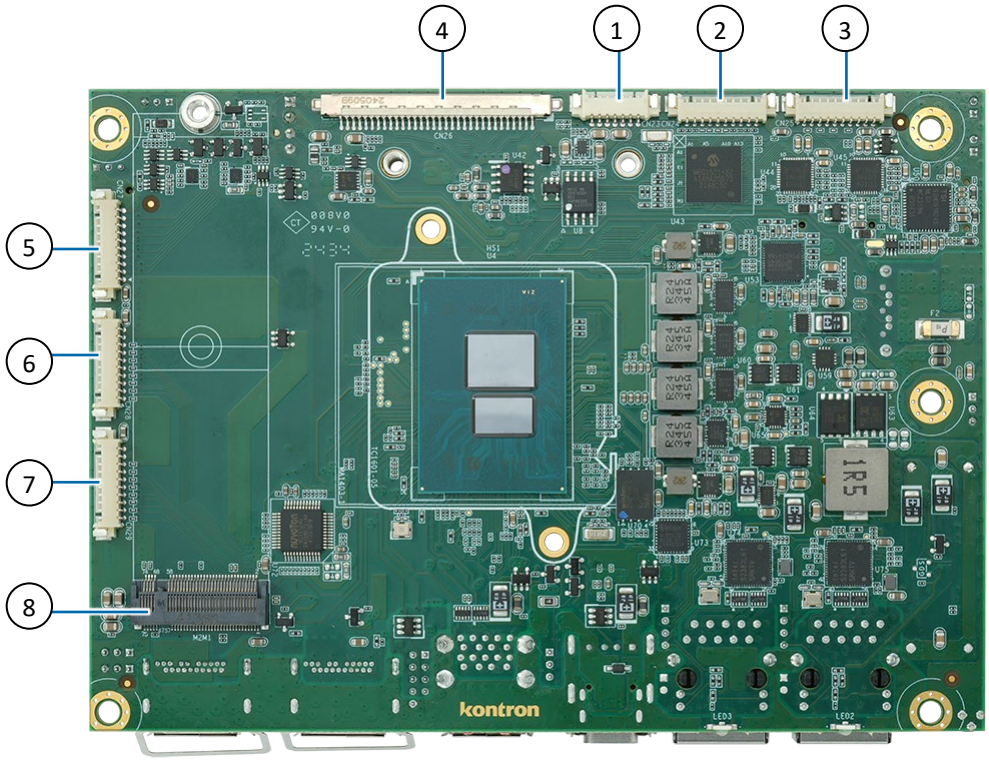


Table 12: Rear Side Internal Connector Pin Assignment

Item	Designation	Description	See Chapter
1	CN23	LVDS / eDP Backlight Power Wafer	7.12
2	CN24	RS232/422/485 COM2 Wafer	7.10
3	CN25	RS232/422/485 COM1 Wafer	7.10
4	CN26	LVDS / eDP Combo Connector	7.11
5	CN27	GPIO Wafer	7.14
6	CN28	RS232/422/485 COM3 Wafer	7.10
7	CN29	RS232/422/485 COM4 Wafer	7.10
8	M2M1	M.2 Key M 2280 Slot	7.18

4.3. Connector Panel Side

Figure 5: Connector Panel Side – 3.5”-SBC-AML/ADN

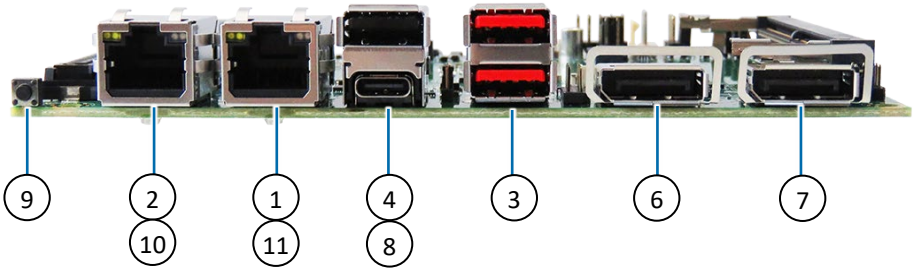


Figure 6: Connector Panel Side – 3.5”-SBC-AMH/ADH

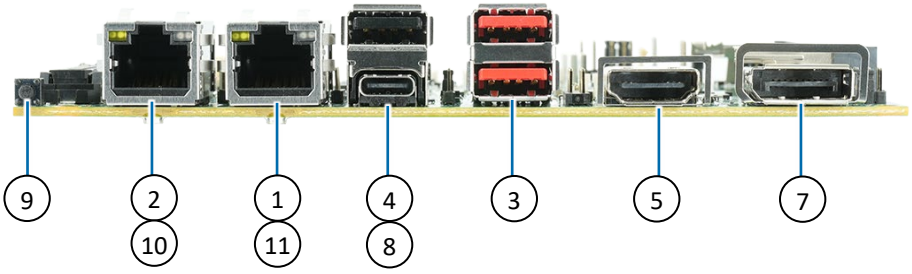


Table 13: Connector Panel Side Connector List

Item	Designation	Description	See Chapter
1	CN15	2.5 GbE LAN2 RJ45 Connector	6.1
2	CN16	2.5 GbE LAN1 RJ45 Connector	6.1
3	CN18	USB 3.2 Gen 2 Port 1, 2 Type A Connector	6.5
4	CN19	USB 2.0 Port 5 Type A Connector	6.5
5	CN20	HDMI 2.0 Connector (3.5”-SBC-AMH/ADH only)	6.2
6	CN20	DP Port 1 Connector (3.5”-SBC-AML/ADN only)	6.3
7	CN21	DP Port 2 Connector	6.3
8	CN22	DP over USB 3.2 Gen 2 / Gen 1 Type C Connector	6.4
9	SW1	Power Button	6.6
10	LED2	Power LED	6.7
11	LED3	Standby LED	6.7

5/Connector Definitions

The following defined terms are used within this user guide to give more information concerning the pin assignment and to describe the connector's signals.

Defined Term	Description
Pin	Shows the pin numbers in the connector
Signal	The abbreviated name of the signal at the current pin The notation "XX#" states that the signal "XX" is active low
Note	Special remarks concerning the signal
Designation	Type and number of item described
See Chapter	Number of the chapter within this user guide containing a detailed description

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

6/I/O-Area Connectors

6.1. Ethernet Connectors (CN15 & CN16)

The 3.5"-SBC-AML/ADN/AMH/ADH supports two channels of 10/100/1000/2500 Mbit Ethernet, which are based Intel® I226-V/IT controllers.

In order to achieve the specified performance of the Ethernet port, Category 5 twisted pair cables must be used with 10/100 MByte and Category 5E, 6 or 6E with 1 Gbit/2.5 Gbit LAN networks.

The signals for the Ethernet ports are as follows:

Figure 7: Ethernet Connector CN15, CN16

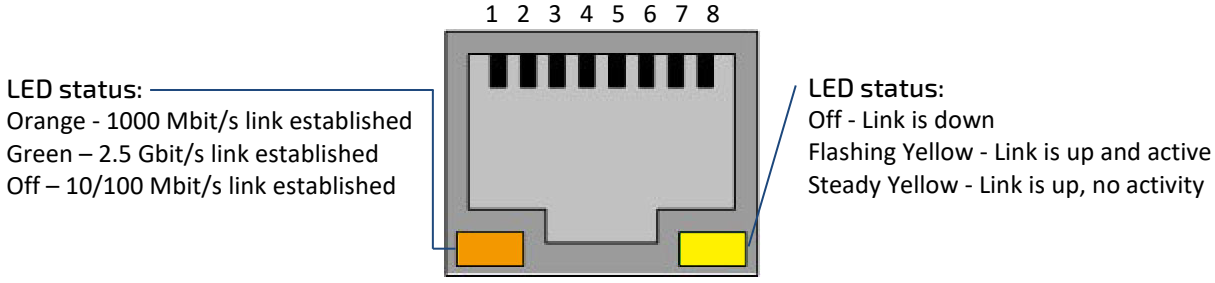


Table 14: Pin Assignment Ethernet Connectors CN15, CN16

Pin	Signal	Note
1	TX1+	
2	TX1-	
3	TX2+	
4	TX3+	
5	TX3-	
6	TX2-	
7	TX4+	
8	TX4-	

Signal Description

Signal	Description
TX1+ / TX1-	In MDI mode, this is the first pair in 2.5GBase-T and 1000Base-T, and is the transmit pair in 10Base-T and 100Base-TX. In MDI crossover mode, this pair is the receive pair in 10Base-T and 100Base-TX.
TX2+ / TX2-	In MDI mode, this is the second pair in 2.5GBase-T and 1000Base-T, and is the receive pair in 10Base-T and 100Base-TX. In MDI crossover mode, this pair is the transmit pair in 10Base-T and 100Base-TX.
TX3+ / TX3-	In MDI mode, this is the third pair in 2.5GBase-T and 1000Base-T.
TX4+ / TX4-	In MDI mode, this is the fourth pair in 2.5GBase-T and 1000Base-T.

'MDI' – media dependent Interface

6.2. HDMI Connector (CN20)

The 3.5“-SBC-AMH/ADH supports one HDMI connector on the external I/O connector panel. The HDMI connector is based on standard HDMI Type A and compliant with HDMI 2.0.

Figure 8: HDMI Connector CN20

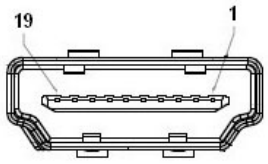


Table 15: Pin Assignment HDMI Connector CN20

Pin	Signal	Description	Note
1	TMDS Data2+	HDMI Lane 2 transmitter differential pair (+)	
2	GND	Ground	
3	TMDS Data2-	HDMI Lane 2 transmitter differential pair (-)	
4	TMDS Data1+	HDMI Lane 1 transmitter differential pair (+)	
5	GND	Ground	
6	TMDS Data1-	HDMI Lane 1 transmitter differential pair (-)	
7	TMDS Data0+	HDMI Lane 0 transmitter differential pair (+)	
8	GND	Ground	
9	TMDS Data0-	HDMI Lane 0 transmitter differential pair (-)	
10	TMDS Clock+	HDMI Clock differential pair (+)	
11	GND	Ground	
12	TMDS Clock-	HDMI Clock differential pair (-)	
13	Reserved	No connection on device pin	
14	Reserved	No connection on device pin	
15	DDC_CLK	DDC based control signal (clock)	
16	DDC_DATA	DDC based control signal (data)	
17	GND	Ground	
18	+5 V Power	+5 V power supply	
19	Hot Plug Detect	HDMI hot plug detect	

6.3. DP Connector (CN20 & CN21)

The 3.5"-SBC-AML/ADN supports two DP (DisplayPort) connectors (CN20 & CN21) on the external I/O connector panel while the 3.5"-SBC-AMH/ADH supports only one (CN21). The DP connectors are based on standard DP female port.

Figure 9: DP Connector CN20, CN21

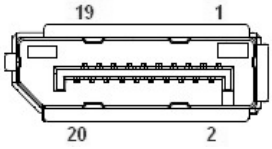


Table 16: Pin Assignment DP Connector CN20, CN21

Pin	Signal	Description	Note
1	ML_Lane0p	DisplayPort Lane 0 transmitter differential pair (+)	
2	GND	Ground	
3	ML_Lane0n	DisplayPort Lane 0 transmitter differential pair (-)	
4	ML_Lane1p	DisplayPort Lane 1 transmitter differential pair (+)	
5	GND	Ground	
6	ML_Lane1n	DisplayPort Lane 1 transmitter differential pair (-)	
7	ML_Lane2p	DisplayPort Lane 2 transmitter differential pair (+)	
8	GND	Ground	
9	ML_Lane2n	DisplayPort Lane 2 transmitter differential pair (-)	
10	ML_Lane3p	DisplayPort Lane 3 transmitter differential pair (+)	
11	GND	Ground	
12	ML_Lane3n	DisplayPort Lane 3 transmitter differential pair (-)	
13	Config1	Connected to ground, either directly or through a pulldown device	
14	Config2	Connected to ground, either directly or through a pulldown device	
15	AUX_CHp	DisplayPort Auxiliary channel differential pair (+)	
16	GND	Ground	
17	AUX_CHn	DisplayPort Auxiliary channel differential pair (-)	
18	Hot_Plug	DisplayPort hot plug detect	
19	GND	Ground	
20	DP_PWR	Power for connector	

6.4. DP over USB Type C Connector (CN22)

The DP (DisplayPort) over USB Type C connector supports DisplayPort Alternate Mode, USB 3.2 Gen 2 (variants with Intel® Atom® x7000E Series, Intel® Core™ i3 N-Series & Intel® N-Series processors) / Gen 1 (variants with Intel® Atom® x7000RE Series processors) and power delivery of up to 15 W (5 V at 3 A).

Figure 10: DP over USB Type C Connector CN22

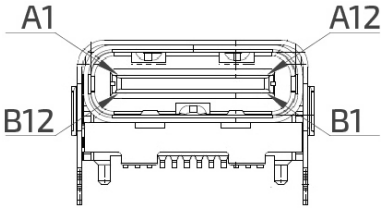


Table 17: Pin Assignment DP over USB Type C Connector CN22

Pin	Signal	Description	Note
A1	GND	Ground	
A2	CON_TX1P_C	USB 3.2 Tx differential pair (+) / DP Lane 2 Tx differential pair (+)	
A3	CON_TX1N_C	USB 3.2 Tx differential pair (-) / DP Lane 2 Tx differential pair (-)	
A4	+5V_VBUS*	+5 V bus power	
A5	CC1	Configuration channel signal 1	
A6	USB2_P	USB 2.0 differential pair (+), position 1	
A7	USB2_N	USB 2.0 differential pair (-), position 2	
A8	SBU1	Sideband use signal 1: DP Auxiliary channel differential pair (+)	
A9	+5V_VBUS*	+5 V bus power	
A10	CON_RX2N_C	DP Lane 0 Tx differential pair (-)	
A11	CON_RX2P_C	DP Lane 0 Tx differential pair (+)	
A12	GND	Ground	
B1	GND	Ground	
B2	CON_TX2P_C	DP Lane 1 Tx differential pair (+)	
B3	CON_TX2N_C	DP Lane 1 Tx differential pair (-)	
B4	+5V_VBUS*	+5 V bus power	
B5	CC2	Configuration channel signal 2	
B6	USB2_P	USB 2.0 differential pair (+), position 2	
B7	USB2_N	USB 2.0 differential pair (-), position 2	
B8	SUB2	Sideband use signal 2: DP Auxiliary channel differential pair (-)	
B9	+5V_VBUS*	+5 V bus power	
B10	CON_RX1N_C	USB 3.2 Rx differential pair (-) / DP Lane 3 Tx differential pair (-)	
B11	CON_RX1P_C	USB 3.2 Rx differential pair (+) / DP Lane 3 Tx differential pair (+)	
B12	GND	Ground	

* The power source of VBUX can be selected through JP6.

6.5. USB Connectors (I/O Area)

The external I/O connector panel supports one dual USB 3.2 Gen 2 connector (CN18) and one USB 2.0 connector (CN19).

USB 3.2 Gen 2 ports are backward compatible with USB 3.2 Gen 1 and USB 2.0.

Figure 11: USB 3.2 Gen 2 Connectors CN18 - Top & Bottom

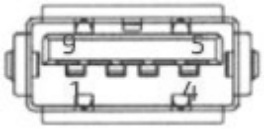


Table 18: Pin Assignment USB 3.2 Gen 2 Connectors CN18 - Top & Bottom

Pin	Signal	Description	Note
1	+USB_VCC*	+5 V power supply for USB device	
2	USB_D-	USB 2.0 differential pair (-)	
3	USB_D+	USB 2.0 differential pair (+)	
4	GND	Ground	
5	USB_RX-	USB 3.2 receiver differential pair (-)	
6	USB_RX+	USB 3.2 receiver differential pair (+)	
7	GND	Ground	
8	USB_TX-	USB 3.2 transmitter differential pair (-)	
9	USB_TX+	USB 3.2 transmitter differential pair (+)	

* The power source of +USB_VCC can be selected through JP6.

Figure 12: USB 2.0 Connectors CN19

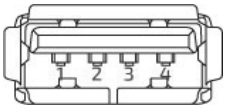


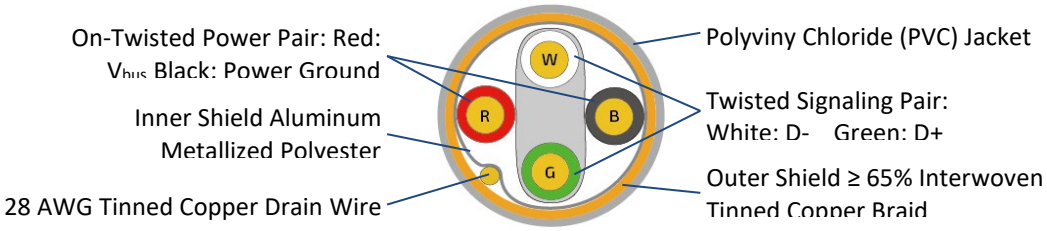
Table 19: Pin Assignment USB 2.0 Connectors CN19

Pin	Signal	Description	Note
1	+USB_VCC*	+5 V power supply for USB device	
2	USB_D-	USB 2.0 differential pair (-)	
3	USB_D+	USB 2.0 differential pair (+)	
4	GND	Ground	

* The power source of +USB_VCC can be selected through JP6.

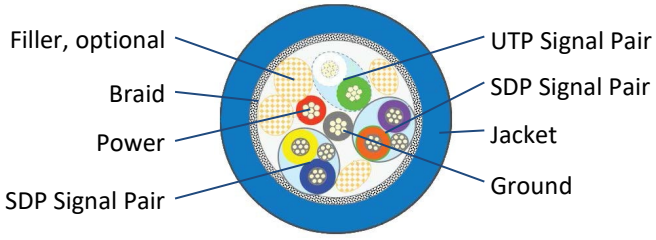
For HiSpeed rates it is required to use a USB cable, which is specified in USB 2.0 standard:

Figure 13: USB 2.0 High Speed Cable



For USB 3.2 Gen 2 cabling it is required to use only HiSpeed USB cable, specified in USB 3.2 standard:

Figure 14: USB 3.2 High Speed Cable



6.6. Power Button (SW1)

The external I/O connector panel supports a power button (SW1) for turning on and off the board.

6.7. LED Indicators (LED2 & LED3)

The external I/O connector panel supports one power LED indicator (LED2) and one standby LED indicator (LED3) for power and standby status indication.

Table 20: LED Indicators LED2, LED3

LED Status		Description
Power LED (LED2)	Standby LED (LED3)	
Green LED On	Yellow LED On	S0 (Full On)
Green LED Blink	Yellow LED On	S3 (Suspend-To-RAM)
LED Off	Yellow LED On	S4 (Suspend-To-Disk) or S5 (Soft Off)
LED Off	LED Off	EUP Mode or G3 (Mechanical Off)

7/Internal Connectors

7.1. Power Connector

Power connector must be used to supply the board with a single DC power within the range between 9 V and 36 V (± 5 %).

NOTICE

Hot plugging any of the power connectors is not allowed.

Hot plugging might damage the board. In other words, turn off main supply etc. to make sure all the power lines are turned off when connecting to the motherboard.

7.1.1. Power Input Wafer (CN9)

The 1x4-pin 3.0 mm pitch power input wafer CN9 provides a single DC power within the range between 9 V and 36 V to the board.

Figure 15: Power Input Wafer CN9

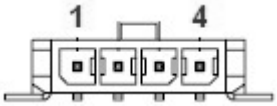


Table 21: Pin Assignment CN9

Pin	Signal	Description	Note
1	+Vin*	Power input	
2	GND	Ground	
3	GND	Ground	
4	+Vin*	Power input	
Connector Type			
B2W, 1x4-pin, 3.0 mm pitch			
Mating Connector			
Vendor Housing Model No. Terminal Model No.	Pinrex 733-75-M104B6 733-70-FT0006		

In case of:

- using 12 V supply for LVDS / eDP backlight (refer to Chapter 7.12, CN23);
- using 12 V supply for SATA HDD / SSD (refer to Chapter 7.4, CN8);
- connecting a cooling fan (refer to Chapter 7.2, CN5); and / or
- connecting a daughter board via the board-to-board connector (refer to Chapter 7.21, CN13),

It is recommended that +Vin be above 16 V in order to have a stable 12 V supply for LVDS / eDP backlight, SATA HDD / SSD, smart fan and / or daughter board.

7.1.2. RTC Power Input Wafer (CN14)

The 1x2-pin 1.25 mm pitch RTC power input wafer CN14 is intended to be connected to the battery. The battery provides power to the system clock to retain the time when power is turn off.

Figure 16: RTC Power Input Wafer CN14

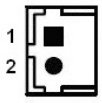


Table 22: Pin Assignment CN14

Pin	Signal	Description	Note
1	+VRTC	Real-time clock backup battery input	
2	GND	Ground	
Connector Type			
B2W, 1x2-pin, 1.25 mm pitch			
Mating Connector			
Vendor Housing Model No. Terminal Model No.	Pinrex 712-75-02W001 712-70-T00001		

7.2. Fan Wafer (CN5)

The 1x4-pin 2.54 mm pitch fan wafer CN5 is used for the connection of the fan for the processor or system.

Figure 17: Fan Wafer CN5

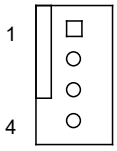


Table 23: Pin Assignment CN5

Pin	Signal	Description	Note
1	GND	Power supply ground signal	
2	V_{FAN}	Power supply for fan › V_{FAN} = +12 V in case of Vin between 15 V and 36 V › V_{FAN} = Vin – V_{DROP} ($\leqq$ +12 V) in case of Vin between 9 V and 15 V Depending on the SBC load, V_{DROP} (Voltage Drop) is approximately 1 V ~ 3 V.	1 A max.
3	SENSE	Sense input signal from the fan, for rotation speed supervision RPM (Rotations Per Minute).	
4	PWM	PWM output signal for FAN speed control	
Connector Type			
B2W, 1x4-pin, 2.54 mm pitch			

7.3. SATA (Serial ATA) Connector (CN10)

The SATA connector CN10 supplies the data connection for the SATA hard disk and is SATA 3.0 compatible.

Figure 18: SATA Connector CN10

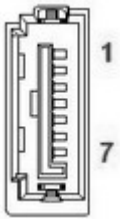


Table 24: Pin Assignment CN10

Pin	Signal	Description	Note
1	GND	Ground	
2	TX+	Host transmitter differential signal pair (+)	
3	TX-	Host transmitter differential signal pair (-)	
4	GND	Ground	
5	RX-	Host receiver differential signal pair (-)	
6	RX+	Host receiver differential signal pair (+)	
7	GND	Ground	
Connector Type			
B2W, 1x7-pin, 1.27 mm pitch			
Mating Connector			
Vendor Model No.		WINWIN WATC-07DLPO2U	

7.4. SATA Power Output Wafer (CN8)

The 1x4-pin 2.0 mm pitch SATA power output wafer CN8 provides power to the SATA hard disk.

Figure 19: SATA Power Output Wafer CN8

Table 25: Pin Assignment CN8

Pin	Signal	Description	Note
1	V_{HDD}	Power supply for HDD / SSD › V_{HDD} = +12 V in case of Vin between 15 V and 36 V › V_{HDD} = Vin – V_{DROP} ($\leqq$ +12 V) in case of Vin between 9 V and 15 V Depending on the SBC load, V_{DROP} (Voltage Drop) is approximately 1 V ~ 3 V.	1 A max.
2	GND	Ground	
3	GND	Ground	
4	+5V	+5 V power supply for HDD / SSD	1 A max.
Connector Type			
B2W, 1x4-pin, 2.0 mm pitch			
Mating Connector			
Vendor Housing Model No. Terminal Model No.	Pinrex 721-75-04W009 721-70-T00009		

7.5. USB Connectors (Internal) (CN17)

The 10-pin 2.0 mm pitch USB port pin header CN17 supports two USB 2.0 ports.

Figure 20: USB 2.0 Port 5, 6 Pin Header CN17

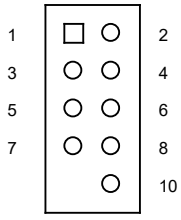


Table 26: Pin Assignment CN17

Pin	Signal	Description	Note
1	+USBVCC*	5 V supply. SB5V is supplied during power down to allow wakeup.	1 A max.
2	+USBVCC*	5 V supply. SB5V is supplied during power down to allow wakeup.	1 A max.
3	USB_DA-	USB 2.0 differential pair (-) for channel A	
4	USB_DB-	USB 2.0 differential pair (-) for channel B	
5	USB_DA+	USB 2.0 differential pair (+) for channel A	
6	USB_DB+	USB 2.0 differential pair (+) for channel B	
7	GND	Ground	
8	GND	Ground	
9	KEY		
10	GND	Ground	

Connector Type	
B2W, 2x5-pin, 2.0 mm pitch	
Mating Connector	
Vendor	Dupont
Housing Model No.	WL2004H-2*5P(DP2.0)
Terminal Model No.	KB931-21T1A

*** The power source of +USBVCC can be selected through JP6.**

7.6. Audio AMP Output Wafer (CN1 & CN6)

The Speaker audio-out interface is available through the 2-pin 2.0 mm pitch wafers CN1 for left channel and CN6 for right channel. These outputs are shared with the audio output (Line-out) signals of the audio pin header CN7.

Figure 21: Audio AMP Output Wafer CN1 (Left Channel), CN6 (Right Channel)

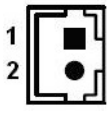


Table 27: Pin Assignment CN1, CN6

Pin	Signal	Description	Note
1	Speaker+	Speaker output (+)	
2	Speaker-	Speaker output (-)	
Connector Type			
B2W, 1x2-pin, 2.0 mm pitch			
Mating Connector			
Vendor	Pinrex		
Housing Model No.	721-75-02W009		
Terminal Model No.	721-70-T00009		

7.7. Audio Input / Output Header (CN7)

The 10-pin 1.25 mm pitch audio input / output header CN7 provides audio output (Line-Out), audio input (Line-In) and microphone (Mic-In) signals. The audio output signals are shared with those of the speaker connectors CN1 & CN6.

Figure 22: Audio Input / Output Header CN7

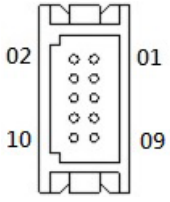


Table 28: Pin Assignment CN7

Pin	Signal	Description	Note
1	MIC-In_L	Microphone input left channel signal	
2	MIC-In_R	Microphone input right channel signal	
3	MIC-In_JD#	Microphone jack detection	
4	Line-In_JD#	Audio input jack detection	
5	Line-In_L	Audio input left channel signal	
6	Line-In_R	Audio input right channel signal	
7	Line-Out_L	Audio output left channel signal	
8	Line-Out_R	Audio output right channel signal	
9	Line-Out_JD#	Audio output jack detection	
10	GND	Ground	
Connector Type			
B2W, 2x5-pin, 1.25 mm pitch			
Mating Connector			
Vendor	HRS		
Housing Model No.	DF13-10DS-1.25C		
Terminal Model No.	WL1255-T-T-S		

7.8. S/PDIF Output Wafer (CN2)

The 3-pin 1.25 mm pitch S/PDIF output wafer CN2 is used to enable a S/PDIF audio output port to carry multi-channel compressed surround sound.

Figure 23: S/PDIF Output Wafer CN2

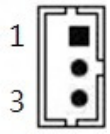


Table 29: Pin Assignment CN2

Pin	Signal	Description	Note
1	SPDIF-O	S/PDIF output	
2	+5V	5 V supply	
3	GND	Ground	
Connector Type			
B2W, 1x3-pin, 1.25 mm pitch			
Mating Connector			
Vendor	Pinrex		
Housing Model No.	712-75-03W001		
Terminal Model No.	712-70-T00001		

7.9. Front Panel Header (FP1 & FP2)

The 8-pin 2.54 mm pitch front panel header FP1 supplies signals for the reset button, M.2 Key B SSD LED and system warning speaker.
The 10-pin 2.54 mm pitch front panel header FP2 supplies signals for the power button, power LED, and SM Bus.

Figure 24: Front Panel Header 1 FP1

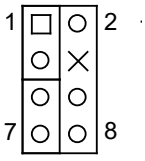


Table 30: Pin Assignment FP1

Pin	Signal	Description	Note
1	Reset Button +	System reset button (+)	
2	Speaker +	External system warning speaker (+)	
3	Reset Button -	System reset button (-)	
4	-	No connection	
5	M2M_LED +	M.2 Key B SSD activity LED (+). The LED lights up or flashes when data is ready from or written to the SSD.	
6	Internal Speaker -	Internal system warning speaker (-)	
7	M2M_LED -	M.2 Key B SSD activity LED (-).	
8	Speaker -	External system warning speaker (-)	

Pin	Signal	Description	Note
Connector Type			
B2W, 2x4-pin, 2.54 mm pitch			
Mating Connector			
Vendor Housing Model No. Terminal Model No.	Pinrex 741-75-204B01 741-70-FT0001		

Internal Buzzer is enabled when Pin 6-8 is shorted.

Figure 25: Front Panel Header 2 FP2

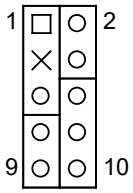


Table 31: Pin Assignment FP2

Pin	Signal	Description	Note
1	Power LED +	System Power LED (+). The LED lights up when users turn on the system power, and blinks when the system is in sleep mode.	
2	Power Button +	System power button (+). Pressing the power button turns the system on or puts the system in sleep or soft-off mode depending on the operating system settings. Pressing the power switch for more than four seconds while the system turns from ON to OFF.	
3	-	No connection	
4	Power Button -	System power button (-).	
5	Power LED -	System Power LED (-).	
6	SM_ALERT#	System Management Bus Alert	
7	BAT_LOW#	Battery low input. This signal may be driven low by external circuitry to signal that the system battery is low. It also can be used to signal some other external power management event.	
8	SMBus Data	System management bus bidirectional data line	
9	GND	Ground	
10	SMBus Clock	System management bus bidirectional clock line	
Connector Type			
B2W, 2x5-pin, 2.54 mm pitch			
Mating Connector			
Vendor Housing Model No. Terminal Model No.	Pinrex 741-75-205B01 741-70-FT0001		

7.10. Serial COM1, COM2, COM3 & COM4 Ports (CN25, CN24, CN28 & CN29)

The 10-pin 1.25 mm pitch serial COM wafers CN24, CN25, CN28 and CN29 provide RS232/422/485 connections.
All wafers support single communication mode on RS485 with only half-duplex configuration.
The wafers CN24 (COM2) and CN25 (COM1) support RS232 without hardware flow control.

Figure 26: Serial COM CN24, CN25, CN28, CN29

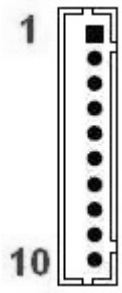


Table 32: Pin Assignment COM1 CN25, COM2 CN24

Pin	RS232 Signal	RS422 Signal	RS485 Signal	Note
1	-	TX-	DATA-	
2	-	-	-	
3	RXD	TX+	DATA+	
4	-	-	-	
5	TXD	RX+	-	
6	-	-	-	
7	-	RX-	-	
8	-	-	-	
9	GND	GND	GND	
10	+5V	+5V	+5V	500 mA max.
Connector Type				
B2W, 1x10-pin, 1.25 mm pitch				
Mating Connector				
Vendor	Pinrex			
Housing Model No.	712-75-10W001			
Terminal Model No.	712-70-T00001			

Table 33: Pin Assignment COM3 CN28, COM4 CN29

Pin	RS232 Signal	RS422 Signal	RS485 Signal	Note
1	DCD	TX-	DATA-	
2	DSR	-	-	
3	RXD	TX+	DATA+	
4	RTS	-	-	
5	TXD	RX+	-	
6	CTS	-	-	
7	DTR	RX-	-	

Pin	RS232 Signal	RS422 Signal	RS485 Signal	Note
8	RI	-	-	
9	GND	GND	GND	
10	+5V	+5V	+5V	500 mA max.
Connector Type				
B2W, 1x10-pin, 1.25 mm pitch				
Mating Connector				
Vendor Housing Model No. Terminal Model No.	Pinrex 712-75-10W001 712-70-T00001			

Table 34: Signal Description

Signal	Description
TXD	Transmitted Data, sends data to the communications link. The signal is set to the marking state (-12 V) on hardware reset when the transmitter is empty or when loop mode operation is initiated.
RXD	Received Data, receives data from the communications link.
DTR	Data Terminal Ready, indicates to the modem etc. that the on-board UART is ready to establish communication link.
DSR	Data Set Ready, indicates that the modem etc. is ready to establish a 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.
DCD	Data Carrier Detect, indicates that the modem or data set has detected the data carrier.
RI	Ring Indicator, indicates that the modem has received a ringing signal from the telephone line.
TX+/-	Transmitted Data differential pair sends data to the communications link.
RX+/-	Received Data differential pair receives data from the communications link.
GND	Power Supply GND signal

7.11. LVDS / eDP Combo Connector (CN26)

The 30-pole 1.0 mm pitch connector CN26 provides either 24-bit, 2-channel LVDS or 2-lane eDP panel connection. The switch between LVDS mode and eDP mode can be configured in the BIOS settings.

Figure 27: LVDS / eDP Combo Connector CN26

Table 35: Pin Assignment CN26

Pin	Signal		Description		Note
	LVDS Mode	eDP Mode	LVDS Mode	eDP Mode	
1	LVDSA_TX0-	-	LVDS Ch. A Data 0 diff. pair (-)	-	
2	LVDSA_TX0+	-	LVDS Ch. A Data 0 diff. pair (+)	-	
3	LVDSA_TX1-	eDP_TX1-	LVDS Ch. A Data 1 diff. pair (-)	eDP Lane 1 diff. pair (-)	
4	LVDSA_TX1+	eDP_TX1+	LVDS Ch. A Data 1 diff. pair (+)	eDP Lane 1 diff. pair (+)	
5	LVDSA_TX2-	eDP_TX0-	LVDS Ch. A Data 2 diff. pair (-)	eDP Lane 0 diff. pair (-)	
6	LVDSA_TX2+	eDP_TX0+	LVDS Ch. A Data 2 diff. pair (+)	eDP Lane 0 diff. pair (+)	
7	GND		Ground		
8	LVDSA_BCLK-	eDP_AUX-	LVDS Ch. A clock diff. pair (-)	eDP aux. ch. diff. pair (-)	
9	LVDSA_BCLK+	eDP_AUX+	LVDS Ch. A clock diff. pair (+)	eDP aux. ch. diff. pair (+)	
10	LVDSA_TX3-	-	LVDS Ch. A Data 3 diff. pair (-)	-	
11	LVDSA_TX3+	-	LVDS Ch. A Data 3 diff. pair (+)	-	
12	LVDSB_TX0-	-	LVDS Ch. B Data 0 diff. pair (-)	-	
13	LVDSB_TX0+	-	LVDS Ch. B Data 0 diff. pair (+)	-	
14	GND		Ground		
15	LVDSB_TX1-	-	LVDS Ch. B Data 1 diff. pair (-)	-	
16	LVDSB_TX1+	-	LVDS Ch. B Data 1 diff. pair (-)	-	
17	GND		Ground		
18	LVDSB_TX2-	-	LVDS Ch. B Data 2 diff. pair (-)	-	
19	LVDSB_TX2+	-	LVDS Ch. B Data 2 diff. pair (+)	-	
20	LVDSB_BCLK-	-	LVDS Ch. B clock diff. pair (-)	-	
21	LVDSB_BCLK+	-	LVDS Ch. B clock diff. pair (+)	-	

Pin	Signal		Description		Note
	LVDS Mode	eDP Mode	LVDS Mode	eDP Mode	
22	LVDSB_TX3-	-	LVDS Ch. B Data 3 diff. pair (-)	-	
23	LVDSB_TX3+	-	LVDS Ch. B Data 3 diff. pair (+)	-	
24	GND		Ground		
25	-	eDP_HPD	-	eDP hot plug detect	
26	VDDEN	VDDEN	Output display enable	Output display enable	
27	-	-	-	-	
28	+VPNL *		+3.3 V / +5 V panel power supply		500 mA max.
29	+VPNL *		+3.3 V / +5 V panel power supply		500 mA max.
30	+VPNL *		+3.3 V / +5 V panel power supply		500 mA max.
Connector Type					
B2W, 1x30-pin, 1.0 mm pitch					
Mating Connector					
Vendor Model No.	JAE FI-X30HL				

* Panel Power can be selected through JP4.

7.12. LVDS / eDP Backlight Power Wafer (CN23)

The 7-pin 1.25 mm pitch wafer CN23 provides power supply for flat panel and its backlight inverter.

Figure 28: LVDS / eDP Backlight Power Wafer CN23

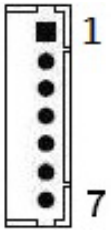


Table 36: Pin Assignment CN23

Pin	Signal	Description	Note
1	BL_EN*	Backlight Enable signal	
2	GND	Ground	
3	+VBKLT**	Backlight power supply › +VBKLT = +5 V in case of backlight power selected as +5 V through JP2	750 mA max.
4	+VBKLT**	› +VBKLT = +12 V in case of backing power selected as +12 V / Vin - V_{DROP} and Vin between 15 V and 36 V › +VBKLT = Vin – V_{DROP} ($\leqq$ +12 V) in case of backlight power selected as +12 V / Vin - V_{DROP} and Vin between 9 V and 15 V Depending on the SBC load, V_{DROP} (Voltage Drop) is approximately 1 V ~ 3 V.	750 mA max.

Pin	Signal	Description	Note
5	GND	Ground	
6	NC	Non connection	
7	BL_ADJ_PWM	Backlight Adjustment PWM (Pulse Width Modulation) signal	
Connector Type			
B2W, 1x7-pin, 1.25 mm pitch			
Mating Connector			
Vendor Housing Model No. Terminal Model No.	Pinrex 712-75-07W001 712-70-T00001		

* BL_EN can be selected through JP2.

** Backlight Power can be selected through JP4.

7.13. LVDS / eDP Backlight Brightness Wafer (CN32)

The 3-pin 1.25 mm pitch wafer CN32 provides signals for backlight brightness level adjustment.

Figure 29: LVDS / eDP Backlight Brightness Wafer CN32

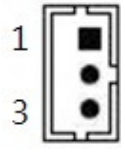


Table 37: Pin Assignment CN32

Pin	Signal	Description	Note
1	LVDS_BL_UP	Increase LVDS / eDP backlight brightness level	
2	LVDS_BL_DN	Decrease LVDS / eDP backlight brightness level	
3	GND	Ground	
Connector Type			
B2W, 1x3-pin, 1.25 mm pitch			
Mating Connector			
Vendor Housing Model No. Terminal Model No.	Pinrex 712-75-03W001 712-70-T00001		

7.14. General Purpose Input / Output Header (CN27)

The 10-pin 1.25 mm pitch header CN27 supports 8-bit general purpose input / output signals to provide powering-on function of the connected devices.

Figure 30: General Purpose Input / Output Header CN27

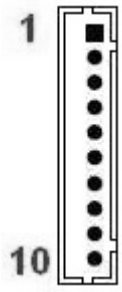


Table 38: Pin Assignment CN27

Pin	Signal	Description	Type & Termination	Input Threshold	ESD Protection	Note
1	+5V	+5 V power supply	PWR 5 V	-	4KV	500 mA max.
2	GPIO0	General purpose input / output 0	I/OD PU-10K to +5 V	L < 0.15 V H > 3.25 V	-	
3	GPIO1	General purpose input / output 1			-	
4	GPIO2	General purpose input / output 2			-	
5	GPIO3	General purpose input / output 3			-	
6	GPIO4	General purpose input / output 4			-	
7	GPIO5	General purpose input / output 5			-	
8	GPIO6	General purpose input / output 6			-	
9	GPIO7	General purpose input / output 7			-	
10	GND	Ground	PWR GND	-	-	

Connector Type	
B2W, 1x10-pin, 1.25 mm pitch	
Mating Connector	
Vendor	Pinrex
Housing Model No.	712-75-10W001
Terminal Model No.	712-70-T00001

7.15. SPI 10-Pins Header (CN11)

The 10-pin 1.27 mm pitch header CN11 allows connection with a MCU (MicroController Unit) module for a particular application.

Figure 31: SPI 10-Pins Header CN11

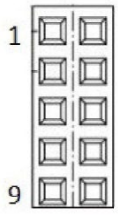


Table 39: Pin Assignment CN11

Pin	Signal	Description	Note
1	VDD	Primary supply input	
2	GND	Ground	
3	CS1#	SPI slave chip select bit 1	
4	CS0#	SPI slave chip select bit 0	
5	HOLD#	SPI HOLD	
6	SO	SPI slave serial data output	
7	SCK	SPI clock input	
8	WP#	Write-protect pin	
9	SI	SPI slave serial data input	
10	EN	Enable pin	
Connector Type			
B2B, 2x5-pin, 1.27 mm pitch			

7.16. M.2 Key B 2242 / 3042 / 3052 / 2280 Slot (M2B1)

The 3.5"-SBC-AML/ADN/AMH/ADH supports a M.2 module in format 2242 / 3042 / 3052 / 2280 with Key B. The M.2 specification supports PCIe x1 and USB 2.0 signals as well as UIM signals connected to SIM card wafer CN3. The slot can be used to integrate WWAN communication or other possible functions to the mainboard.

Figure 32: M.2 Key B 2242 / 3042 / 3052 / 2280 Slot M2B1

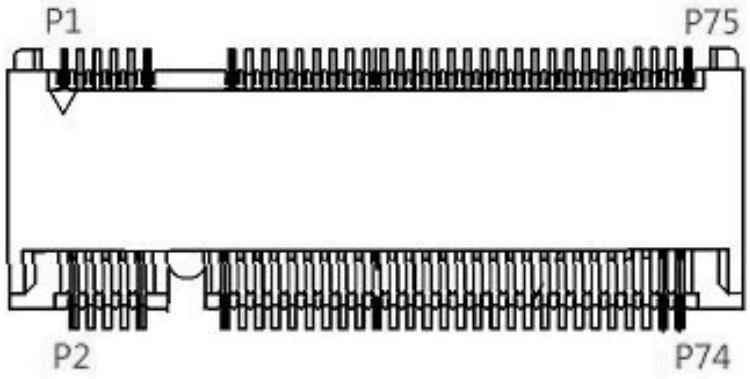


Table 40: Pin Assignment M2B1

Pin	Signal	Description	Note
1	-		
2	+3.3V	3.3 V power supply	
3	GND	Ground	
4	+3.3V	3.3 V power supply	
5	GND	Ground	
6	PWROFF#	M.2 module power enable	
7	USB_D+	USB 2.0 data differential pair (+)	
8	DISABLE#	Wireless disable	
9	USB_D-	USB 2.0 data differential pair (-)	
10	-		
11	GND	Ground	
12	KEY		
13	KEY		
14	KEY		
15	KEY		
16	KEY		
17	KEY		
18	KEY		
19	KEY		
20	-		
21	-		
22	-		
23	-		
24	-		

Pin	Signal	Description	Note
25	-		
26	-		
27	GND	Ground	
28	-		
29	-		
30	UIM_RESET*	SIM card reset	
31	-		
32	UIM_CLK*	SIM card clock	
33	GND	Ground	
34	UIM_DATA*	SIM card data	
35	-		
36	UIM_PWR*	SIM card power	
37	-		
38	-		
39	GND	Ground	
40	-		
41	PERn0	PCIe Lane 0 receiver pair (-)	
42	-		
43	PERp0	PCIe Lane 0 receiver pair (+)	
44	-		
45	GND	Ground	
46	-		
47	PETn0	PCIe Lane 0 transmitter pair (-)	
48	-		
49	PETp0	PCIe Lane 0 transmitter pair (+)	
50	PERST#	PCIe reset	
51	GND	Ground	
52	CLKREQ#	Reference clock request signal	
53	-		
54	WAKE#	PCIe wake	
55	-		
56	-		
57	GND	Ground	
58	-		
59	-		
60	-		
61	-		
62	-		
63	-		
64	-		

Pin	Signal	Description	Note
65	-		
66	SIM_DETECT	SIM card detect	
67	-		
68	SUSCLK	32.768 kHz clock supply input	
69	-		
70	+3.3V	3.3 V power supply	
71	GND	Ground	
72	+3.3V	3.3 V power supply	
73	GND	Ground	
74	+3.3V	3.3 V power supply	
75	-		

* These pins are connected to CN3 SIM card wafer directly.

7.17. M.2 Key E 2230 Slot (M2E1)

The 3.5"-SBC-AML/ADN/AMH/ADH supports a M.2 module in format 2230 with Key E. The M.2 specification supports PCIe x1, USB 2.0, UART, PCM and / or CNVi signals (variants with Intel® Atom® x7000RE Series processors do not support CNVi). The slot can be used to integrate WLAN (Wi-Fi or CNVi Wi-Fi) and / or Bluetooth communication or other possible function to the mainboard.

Figure 33: M.2 Key E 2230 Slot M2E1

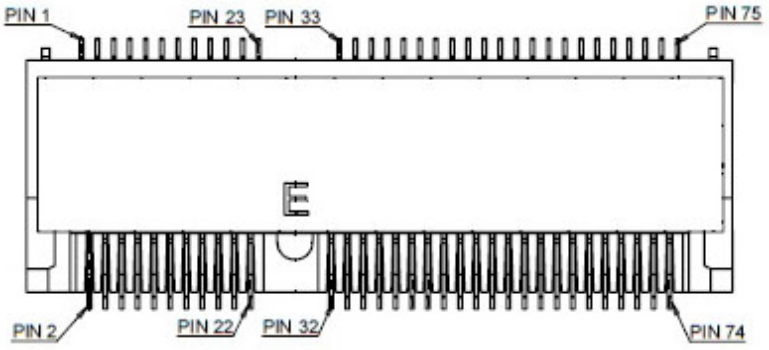


Table 41: Pin Assignment M2E1

Pin	Key E*		CNVi*		Note
	Signal	Description	Signal	Description	
1	GND	Ground	GND	Ground	
2	+3.3V_SB	3.3 V standby power supply	+3.3V_SB	3.3 V standby power supply	
3	USB_D+	USB 2.0 data diff. pair (+)	-		
4	+3.3V_SB	3.3 V standby power supply	+3.3V_SB	3.3 V standby power supply	
5	USB_D-	USB 2.0 data diff. pair (-)	-		
6	LED1#	Device active signal 1	-		
7	GND	Ground	GND	Ground	
8	PCM_CLK	PCM synchronous data clock	-		
9	-		WGR_D1N	CNVio bus Rx Lane 1 (-)	
10	PCM_SYNC	PCM synchronous data sync	LCP_RSTN	RF companion (CRF) reset	
11	-		WGR_D1P	CNVio bus Rx Lane 1 (+)	
12	PCM_IN	PCM synchronous data input	-		
13	GND	Ground	GND	Ground	
14	PCM_OUT	PCM synchronous data output	CLKREQ0	Clock request	
15	-		WGR_D0N	CNVio bus Rx Lane 0 (-)	
16	LED2#	Device active signal 2	-		
17	-		WGR_D0P	CNVio bus Rx Lane 0 (+)	
18	GND	Ground	GND	Ground	
19	GND	Ground	GND	Ground	
20	UART_WAKE#	UART wake-up	-		
21	-		WGR_CLKN	CNVio bus Rx clock (-)	
22	UART_RX	UART data input	BRI_RSP	BRI bus Rx	
23	-		WGR_CLKP	CNVio bus Rx clock (+)	

Pin	Key E*		CNVi*		Note
	Signal	Description	Signal	Description	
24	Key		Key		
25	Key		Key		
26	Key		Key		
27	Key		Key		
28	Key		Key		
29	Key		Key		
30	Key		Key		
31	Key		Key		
32	UART_TX	UART data output	RGI_DT	RGI bus Tx	
33	GND	Ground	GND	Ground	
34	UART_CTS	UART clear to send	RGI_RSP	RGI bus Rx	
35	PET0+	PCIe Lane 0 Tx pair (+)	-		
36	UART_RTS	UART request to send	BRI_DT	BRI bus Tx	
37	PET0-	PCIe Lane 0 Tx pair (-)	-		
38	Clink_RST	Wi-Fi CLINK host bus reset	-		
39	GND	Ground	GND	Ground	
40	Clink_DATA	Wi-Fi CLINK host bus data	-		
41	PER0+	PCIe Lane 0 Rx pair (+)	-		
42	Clink_CLK	Wi-Fi CLINK host bus clock	-		
43	PER0-	PCIe Lane 0 Rx pair (-)	-		
44	-		-		
45	GND	Ground	GND	Ground	
46	-		-		
47	REFCLK0+	PCIe reference clock pair (+)	-		
48	-		-		
49	REFCLK0-	PCIe reference clock pair (-)	-		
50	SUSCLK	32.768 kHz clock supply input	SUSCLK	32.768 kHz clock supply input	
51	GND	Ground	GND	Ground	
52	PERST0#	PCIe reset	-		
53	CLKREQ0#	Reference clock request signal	-		
54	W_DISABLE2#	Wireless disable 2	W_DISABLE2#	Wireless disable 2	
55	PEWAKE0#	PCIe wake	-		
56	W_DISABLE1#	Wireless disable 1	W_DISABLE1#	Wireless disable 1	
57	GND	Ground	GND	Ground	
58	-		-		
59	-		WT_D1N	CNVio bus Tx Lane 1 (-)	
60	-		-		
61	-		WT_D1P	CNVio bus Tx Lane 1 (+)	
62	-		-		

Pin	Key E*		CNVi*		Note
	Signal	Description	Signal	Description	
63	GND	Ground	GND	Ground	
64	-		-		
65	-		WT_D0N	CNVio bus Tx Lane 0 (-)	
66	PERST0#	PCIe reset	-		
67	-		WT_D0P	CNVio bus Tx Lane 0 (+)	
68	-		-		
69	GND	Ground	GND	Ground	
70	-		-		
71	-		WT_CLKN	CNVio bus Tx clock (-)	
72	+3.3V_SB	3.3 V standby power supply	+3.3V_SB	3.3 V standby power supply	
73	-		WT_CLKP	CNVio bus Tx clock (+)	
74	+3.3V_SB	3.3 V standby power supply	+3.3V_SB	3.3 V standby power supply	
75	GND	Ground	GND	Ground	

* The board will auto-detect the module type and re-configure itself to an appropriate mode.

7.18. M.2 Key M 2280 Slot (M2M1)

The 3.5"-SBC-AML/ADN/AMH/ADH supports a M.2 module in format 2280 with Key M. The M.2 specification supports either SATA 3.0 or PCIe x1 signal. The slot can be used to integrate either a M.2 SATA SSD or a M.2 PCIe SSD to the mainboard.
The default configuration is set to support SATA 3.0 signal. In case of the PCIe x1 signal required, it must be stipulated when ordering, as appropriate signal routing must be applied at the factory.

Figure 34: M.2 Key M 2280 Slot M2M1

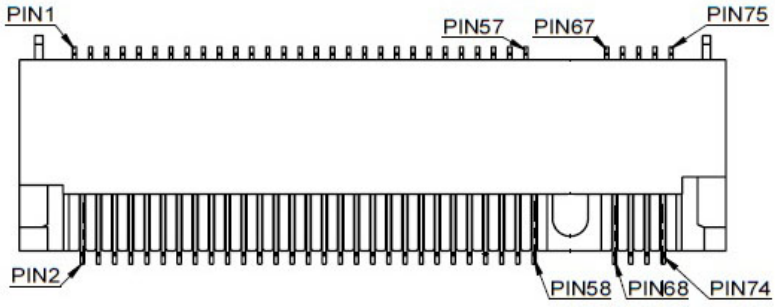


Table 42: Pin Assignment M2M1

Pin	Signal	Description	Note
1	GND	Ground	
2	+3.3V	3.3 V power supply	
3	GND	Ground	
4	+3.3V	3.3 V power supply	
5	-		
6	-		
7	-		
8	-		
9	GND	Ground	
10	DAS / DSS# / LED1#	Device active signal / disable staggered spin-up / LED	
11	-		
12	+3.3V	3.3 V power supply	
13	-		
14	+3.3V	3.3 V power supply	
15	GND	Ground	
16	+3.3V	3.3 V power supply	
17	-		
18	+3.3V	3.3 V power supply	
19	-		
20	-		
21	GND	Ground	
22	-		
23	-		
24	-		

Pin	Signal	Description	Note
25	-		
26	-		
27	GND	Ground	
28	-		
29	-		
30	-		
31	-		
32	-		
33	GND	Ground	
34	-		
35	-		
36	-		
37	-		
38	-		
39	GND	Ground	
40	-		
41	SATA_B+ / PERn0	SATA receiver pair (+) / PCIe Lane 0 receiver pair (-)	
42	-		
43	SATA_B- / PERp0	SATA receiver pair (-) / PCIe Lane 0 receiver pair (+)	
44	-		
45	GND	Ground	
46	-		
47	SATA_A- / PETn0	SATA transmitter pair (-) / PCIe Lane 0 transmitter pair (-)	
48	-		
49	SATA_A+ / PETp0	SATA transmitter pair (+) / PCIe Lane 0 transmitter pair (+)	
50	- / PERST#	Non connection / PCIe reset	
51	GND	Ground	
52	- / CLKREQ#	Non connection / Reference clock request signal	
53	REFCLKn	PCIe reference clock pair (-)	
54	- / PEWAKE#	- / PCIe wake	
55	REFCLKp	PCIe reference clock pair (+)	
56	-		
57	GND	Ground	
58	-		
59	Key		
60	Key		
61	Key		
62	Key		
63	Key		
64	Key		

Pin	Signal	Description	Note
65	Key		
66	Key		
67	-		
68	SUSCLK	32.768 kHz clock supply input	
69	PEDET	PCIe detect	
70	+3.3V	3.3 V power supply	
71	GND	Ground	
72	+3.3V	3.3 V power supply	
73	GND	Ground	
74	+3.3V	3.3 V power supply	
75	GND	Ground	

7.19. SIM Card Wafer for M.2 Key B (CN3)

The SIM card wafer CN3 is intended to enable a SIM card holder to accommodate a SIM card and connected to UIM signals on the M.2 Key B slot M2B1.

Figure 35: SIM Card Wafer CN3

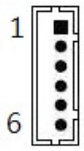


Table 43: Pin Assignment CN3

Pin	Signal	Description	Note
1	+UIM_PWR	Power +5 V or +3.3 V	
2	UIM_DATA	Input or output for serial data	
3	UIM_CLK	Clock signal	
4	UIM_RST	Reset signal	
5	UIM_CD	Card detect	
6	GND	Ground	

7.20. 2.5 GbE LAN LED Header (CN30 & CN31)

The header CN30 is intended to connect 2.5 GbE LAN1 LED cable.

The header CN31 is intended to connect 2.5 GbE LAN2 LED cable.

Figure 36: 2.5 GbE LAN LED Header CN30, CN31

Table 44: Pin Assignment CN30, CN31

Pin	Signal	Description	Note
1	ACT_LED+	LAN activity LED (+)	Off – Link is down Flashing Yellow – Link is up and active Steady Yellow – Link is up, no activity
2	ACT_LED-	LAN activity LED (-)	
3	2.5G_LINK_LED- / GbE_LINK_LED+	LAN speed LED (+)	Orange – 1000 Mbit/s link established Green – 2.5 Gbit/s link established Off – 10/100 Mbit/s link established
4	2.5G_LINK_LED+ / GbE_LINK_LED-	LAN speed LED (-)	
Connector Type			
B2W, 1x4-pin, 2.0 mm pitch			

7.21. Board-to-board Connector (CN13)

The board-to-board connector CN13 provides connection to a daughter board for additional I/O port and / or feature expansion. The specification of the board-to-board connector supports PCIe x1, SM bus, I^2C, UART and GSPI signals. It can an additional PCIe x1 and two USB 2.0 signal optionally by trading off PCIe x1 and USB 2.0 signals on M.2 Key B slot (M2B1) and USB 2.0 Port 3 & 4 Header (CN17) respectively.

Figure 37: Board-to-board Connector CN13

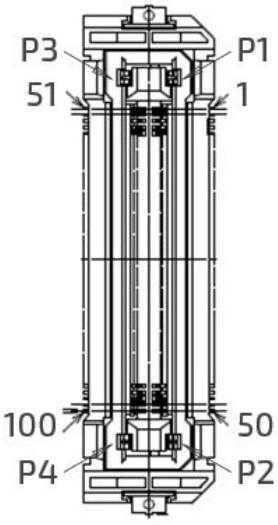


Table 45: Pin Assignment CN13

Pin	Signal	Description	Note
1	VCC_3V3_SBY	3.3 V standby power output	400 mA max.
2	VCC_3V3_SBY	3.3 V standby power output	400 mA max.
3	VCC_3V3_SBY	3.3 V standby power output	400 mA max.
4	VCC_3V3_SBY	3.3 V standby power output	400 mA max.
5	VCC_3V3_SBY	3.3 V standby power output	400 mA max.
6	GND	Ground	
7	-	-	
8	-		
9	GND	Ground	
10	-		
11	-		
12	GND	Ground	
13	-		
14	-		
15	GND	Ground	
16	-		
17	-		
18	GND	Ground	
19	-		
20	-		

Pin	Signal	Description	Note
21	GND	Ground	
22	PCIE0_CLK_REF+	PCIe Lane 0 clock reference pair (+)	
23	PCIE0_CLK_REF-	PCIe Lane 0 clock reference pair (-)	
24	GND	Ground	
25	PCIE0_TX+	PCIe Lane 0 transmitter pair (+)	
26	PCIE0_TX-	PCIe Lane 0 transmitter pair (-)	
27	GND	Ground	
28	PCIE0_RX+	PCIe Lane 0 receiver pair (+)	
29	PCIE0_RX-	PCIe Lane 0 receiver pair (-)	
30	GND	Ground	
31	PCIE2_TX+	PCIe Lane 2 transmitter pair (+)	
32	PCIE2_TX-	PCIe Lane 2 transmitter pair (-)	
33	GND	Ground	
34	PCIE2_RX+	PCIe Lane 2 receiver pair (+)	
35	PCIE2_RX-	PCIe Lane 2 receiver pair (-)	
36	GND	Ground	
37	USB0_D- (Reserved)	USB 2.0 differential pair (-) for channel 0	
38	USB0_D+ (Reserved)	USB 2.0 differential pair (+) for channel 0	
39	GND	Ground	
40	UART_TXD	UART transmitted data	
41	UART_RXD	UART received data	
42	UART_CTS#	UART clear to send	
43	UART_RTS#	UART request to send	
44	GND	Ground	
45	-		
46	-		
47	-		
48	-		
49	-		
50	USB_OC#	Over current detect for USB	
51	GSPI_CLK	General SPI clock	
52	GSPI_MOSI	General SPI master output / slave input	
53	GSPI_MISO	General SPI master input / slave output	
54	GSPI_CS0#	General SPI chip select bit 0	
55	GSPI_CS1#	General SPI chip select bit 1	
56	GND	Ground	
57	-		
58	-		
59	GND	Ground	

Pin	Signal	Description	Note
60	-		
61	-		
62	GND	Ground	
63	-		
64	-		
65	GND	Ground	
66	-		
67	-		
68	GND	Ground	
69	-		
70	-		
71	GND	Ground	
72	PCIE1_CLK_REF+	PCIe Lane 1 clock reference pair (+)	
73	PCIE1_CLK_REF-	PCIe Lane 1 clock reference pair (-)	
74	GND	Ground	
75	-		
76	-		
77	GND	Ground	
78	-		
79	-		
80	GND	Ground	
81	-		
82	-		
83	GND	Ground	
84	-		
85	-		
86	GND	Ground	
87	USB1_D- (Reserved)	USB 2.0 differential pair (-) for channel 1	
88	USB1-D+ (Reserved)	USB 2.0 differential pair (+) for channel 1	
89	GND	Ground	
90	I2C_CK	I2C clock	
91	I2C_DAT	I2C data	
92	SMB_CK	SM bus clock	
93	SMB_DAT	SM bus data	
94	GND	Ground	
95	SMB_ALERT#	SM bus alert	
96	WAKE#	PCIe wake	
97	PLTRST#	PCIe platform reset	
98	-		
99	-		

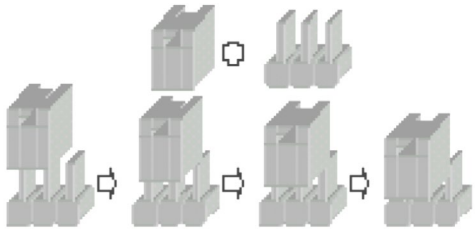
Pin	Signal	Description	Note
100	PS_ON#	Power supply enable / disable	
P1	VCC_5V_SBY	5 V standby power output	2 A max.
P2	VCC_12V_IN_OUT	12 V input (in case of power supplied from daughter board to SBC.) V_{B2B} output (in case of power supplied from SBC to daughter board.) › V_{B2B} = +12 V in case of Vin between 15 V and 36 V › V_{B2B} = Vin – V_{DROP} ($\leqq$ +12 V) in case of Vin between 9 V and 15 V Depending on the SBC load, V_{DROP} (Voltage Drop) is approximately 1 V ~ 3 V.	3 A max.
P3	VCC_12V_IN_OUT		3 A max.
P4	VCC_12V_IN_OUT		3 A max.

Connector Type	
B2B, 2x50-pin, 0.5 mm pitch	
Mating Connector	
Vendor	HRS
Model No.	FX23-100P-0.5SV20

7.22. Switches and Jumpers

The product has several jumpers which must be properly configured to ensure correct operation.

Figure 38: Jumper Connector



For a three-pin jumper (see Figure 38), the jumper setting is designated “1-2” when the jumper connects pins 1 and 2. The jumper setting is designated “2-3” when pins 2 and 3 are connected and so on. You will see that one of the lines surrounding a jumper pin is thick, which indicates pin No.1.
To move a jumper from one position to another, use needle-nose pliers or tweezers to pull the pin cap off the pins and move it to the desired position.

7.22.1. LVDS / eDP Backlight Enable Selection (JP2)

The 2.0 mm patch "LVDS / eDP Backlight Enable Selection" jumper JP2 can be used to select the voltage level and the polarity of backlight enable signal.

Figure 39: LVDS / eDP Backlight Enable Selection JP2

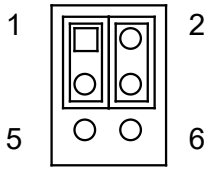


Table 46: Pin Assignment JP2

Jumper 1 Position		Description
Pin 1-3	Pin 3-5	
X	-	Voltage = +3.3 V
-	X	Voltage = +5 V
Jumper 2 Position		**Description**
Pin 2-4	Pin 4-6	
X	-	High Active
-	X	Low Active

“X” = Jumper set (short) and “-” = jumper not set (open)

7.22.2. AT / ATX Power Mode Selection (JP3)

The 2.0 mm pitch jumper JP3 can be used to select AT power mode or ATX power mode.

Figure 40: AT / ATX Power Mode Selection JP3

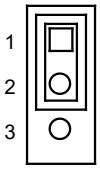


Table 47: Pin Assignment JP3

Jumper 1 Position		Description
Pin 1-2	Pin 2-3	
X	-	ATX Power Mode (Default)
-	X	AT Power Mode

"X" = Jumper set (short) and "-" = jumper not set (open)

7.22.3. LVDS / eDP Backlight & Panel Power Selection (JP4)

The 2.54 mm pitch "LVDS / eDP Backlight & Panel Power Selection" jumper JP4 can be used to select LVDS / eDP backlight and panel power voltage.
The backlight power is +5 V when leaving the Jumper 1 in place on pins 3-5; while the backlight power is either +12 V or Vin -V_{DROP} ($\leqq$ +12 V) depending on the DC input voltage from the power input wafer CN9 when leaving the Jumper 1 in place on pins 1-3.

Figure 41: LVDS / eDP Backlight & Panel Power Selection JP4

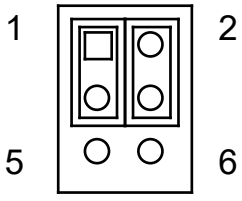


Table 48: Pin Assignment JP4

Jumper 1 Position		Description
Pin 1-3	Pin 3-5	
X	-	Backlight Power = +12 V / Vin – V_{DROP} ($\leqq$ +12 V) (refer to Chapter 7.12, CN23)
-	X	Backlight Power = +5 V
Jumper 2 Position		**Description**
Pin 2-4	Pin 4-6	
X	-	Panel Power = +3.3 V
-	X	Panel Power = +5 V

"X" = Jumper set (short) and "-" = jumper not set (open)

7.22.4. Onboard DC-DC 12 V Selection (JP5)

The 2.0 mm pitch "Onboard DC-DC 12 V Selection" jumper JP5 can be used to enable or disable onboard DC-DC 12 V power supply. When enabled, the board is powered from the DC power input wafer CN9; when disabled, the board is powered from the daughter board via the 12 V power pins in board-to-board connector CN13.

Figure 42: Onboard DC-DC 12 V Selection JP5

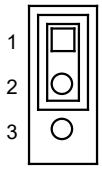


Table 49: Pin Assignment JP5

Jumper 1 Position		Description
Pin 1-2	Pin 2-3	
X	-	DC-DC 12 V Enable
-	X	DC-DC 12 V Disable

"X" = Jumper set (short) and "-" = jumper not set (open)

7.22.5. USB Power Selection (JP6)

The 2.0 mm pitch "USB Power Selection" jumper JP6 can be used to determine whether the USB ports are powered in the S4 / S5 state.

Figure 43: USB Power Selection JP6

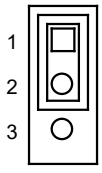


Table 50: Pin Assignment JP6

Jumper 1 Position		Description
Pin 1-2	Pin 2-3	
X	-	+5 V
-	X	+5 VSB

"X" = Jumper set (short) and "-" = jumper not set (open)

7.22.6. Flash Descriptor Security Override Selection (JP7)

The 2.0 mm pitch "Flash Descriptor Security Override Selection" jumper JP7 can be used to specify whether to override the flash descriptor.

Figure 44: Flash Descriptor Security Override Selection JP7

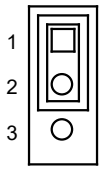


Table 51: Pin Assignment JP7

Jumper 1 Position		Description
Pin 1-2	Pin 2-3	
X	-	Controlled by EC (Embedded Controller)
-	X	Flash Security Override

“X” = Jumper set (short) and “-” = jumper not set (open)

7.22.7. Clear CMOS Selection (JP8)

The 2.0 mm pitch "Clear COMS Selection" jumper JP8 can be used to reset the Real Time Clock (RTC) and drain RTC well.
The jumper has one position: Pin 1-2 mounted (default position) and Pin 2-3 mounted. More information on setting the "Clear CMOS Selection" jumper can be found in the following table.

Figure 45: Clear CMOS Selection JP8

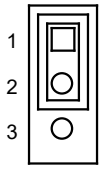


Table 52: Pin Assignment JP8

Jumper 1 Position		Description
Pin 1-2	Pin 2-3	
X	-	Normal Operation (default position)
-	X	Clear CMOS (board does not boot with the jumper in this position)

“X” = Jumper set (short) and “-” = jumper not set (open)

Do not leave the jumper in position 2-3, otherwise if the power is disconnected, the battery will fully deplete within a few weeks.

8/BIOS

8.1. Starting the uEFI BIOS

The 3.5"-SBC-AML/ADN/AMH/ADH is provided with a Kontron-customized, pre-installed and configured version of AMI Aptio® V uEFI BIOS. AMI BIOS firmware is based on the Unified Extensible Firmware Interface (UEFI) specification and the Intel® Platform Innovation Framework for EFI. This uEFI BIOS provides a variety of new and enhanced functions specifically tailored to the hardware features of the 3.5"-SBC-AML/ADN/AMH/ADH.

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

To start the uEFI BIOS setup program, follow the steps below:

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

The 3.5"-SBC-AML/ADN/AMH/ADH uEFI BIOS setup program uses a hot key-based navigation system. A hot key legend bar is located on the bottom of the setup screens.

The following table provides information concerning the usage of these hot keys.

Table 53: Hotkeys Table

Signal	Description
<F1>	The <F1> key invokes the General Help window.
<->	The <Minus> key selects the next lower value within a field.
<+>	The <Plus> key selects the next higher value within a field.
<F2>	The <F2> key loads the previous values.
<F3>	The <F3> key loads the standard default values.
<F4>	The <F4> key saves the current settings and exit the uEFI BIOS setup.
<→> or <←>	The <Left/Right> arrows select major setup menus on the menu bar. For example: Main, Advanced, Security, etc.
<↑> or <↓>	The <Up/Down> arrows select fields in the current menu. For example: A setup function or a sub-screen.
<ESC>	The <ESC> key exits a major setup menu and enter the Exit setup menu. Pressing the <ESC> key in a sub-menu displays the next higher menu level.
<ENTER>	The <ENTER> key executes a command or select a submenu.

8.2. Starting the uEFI BIOS

The Setup utility feature shows six menus in the selection bar at the top of the screen:

- Main
- Advanced
- Chipset
- Security
- Boot
- Save & Exit

The Setup menus are selected via the left and right arrow keys. The currently active menu and the currently active uEFI BIOS Setup items are highlighted in white. Each Setup menu provides two main frames. The left frame displays all available functions. Functions that can be configured are displayed in blue. Functions displayed in gray provide information about the status or the operational configuration. The right frame displays an Item Specific Help window providing an explanation of the respective function.

8.2.1. Main Setup Menu

Upon entering the uEFI BIOS Setup program, the Main Setup menu is displayed. This screen lists the Main Setup menu sub-screens and provides basic system information. Additionally functions for setting the system time and date are offered.

Table 54: Main Setup Menu Sub-Screens and Functions

Function	Description
Product Information	Read only field. Displays information about the product name
BIOS Information	Read only field. Displays information about the system BIOS
FSP Information	Read only field. Display information about the FSP
Processor Information	Read only field. Display information about the processor
Memory Information	Read only field. Displays information about the memory
PCH Information	Read only field. Display information about the PCH
ME Information	Read only field. Display information about Intel Management Engine (ME) firmware
System Language	Read only field. [English] only
Platform Information	Sub-screen to board information.
System Date	Set System Date
System Time	Set System Time

Figure 46: BIOS Main Menu Screen System Data and Time

Aptio Setup – AMI					
Main	**Advanced**	**Chipset**	**Security**	**Boot**	**Save & Exit**
Product Information					
Product Name		3.5-SBC-ADN_AML (3.5-SBC-ADH_AMH)			
BIOS Information					
BIOS Vendor		American Megatrends			
Core Version		5.27			
Compliancy		UEFI 2.8; PI 1.7			
Kontron BIOS Version		ADNUEXR.100 (x64)			
Access Level		Administrator			
Hide Default CRB Setup Items		[Disabled]			
FSP Information					
FSP Version		0C.02.89.40			
RC Version		0C.E0.89.40			
Build Date					
FSP Mode		Dispatch Mode			
Board Information					
Board Name		3.5-SBC-ADN_AML (3.5-SBC-ADH_AMH)			
Board ID		N/A			
Fab ID		Default string			
LAN PHY Revision		N/A			
Processor Information					
Name		Alder Lake ULX			
Type		Intel® Atom® x7433RE			
Speed		1500 MHz			
ID		0xB06E0			
Stepping		A0			
Package		Not Implemented Yet			
Number of Efficient-cores		4 Core(s) / 4 Thread(s)			
Microcode Revision		17			
GT Info		0x46D0			
eDRAM Size		N/A			
IGFX GOP Version		21.0.1063			
Memory RC Version		0.0.4.74			
Total Memory		16384 MB			

Aptio Setup – AMI					
Main	**Advanced**	**Chipset**	**Security**	**Boot**	**Save & Exit**
Memory Frequency		4800 MHz			
PCH Information					
Name		PCH-N			
PCH SKU		N ASL IOT INDU SKU			
Stepping		A0			
Chipset Init Base Revision		4			
Chipset Init OEM Revision		0			
Package		Not Implemented Yet			
TXT Capability of Platform / PCH		Unsupported			
Production Type		Production			
Dual Output Fast Read support		Supported			
Read ID / Status Clock Freq		50 MHz			
Write and Erase Clock Freq		50 MHz			
Fast Read Clock Freq		50 MHz			
Fast Read support		Supported			
Number of Components		1 Component			
SPI Component 0 Density		32 MB			
eSPI Flash Sharing Mode		G3			
EC PECI Mode		Legacy PECI mode			
ME FW Version		16.50.12.1453		→←: Select Screen	
ME Firmware SKU		Consumer SKU		↑ ↓: Select Item	
PMC FW Version		160.50.0.1010		Enter: Select	
				+/-: Change Opt.	
System Language		[English]		F1: General Help	
> Platform Information				F2: Previous Values	
				F3: Optimized Defaults	
System Date		[Tue 03/25/2025]		F4: Save & Exit	
System Time		[15:52:06]		ESC: Exit	
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Feature	Option	Description
Hide Default CRB Setup Items	[Disabled], [Enabled]	For RD Test Only!!
System Date	[dd/mm/yyyy]	Set the Date. Use Tab to switch between Data elements.
System Time	[hh:mm:ss]	Set the Time. Use Tab to switch between Time elements.

Figure 47: BIOS Main Menu Screen – Platform Information

Aptio Setup – AMI		
Main		
Product Information		
Product Name	3.5-SBC-ADN_AML (3.5-SBC-ADH_AMH)	
Serial #	Default string	
UUID	00020003-0004-0005-0006-000700080009	
KSC Information		
Controller	KSC Main Controller	
Operating Mode	Normal	
Board Name	3.5-SBC-ADN	
Platform ID	000A	→←: Select Screen
KSC SW Spec. Version	1.20	↑ ↓: Select Item
BIOS Protocol Version	2.3.1	Enter: Select
BIOS SW Spec. Version	1.18	+/-: Change Opt.
Core Firmware Version	1.4.0 RC 1	F1: General Help
Board Firmware Version	1.0.0 RC 1	F2: Previous Values
SCM Info	F2-3A-5A-93	F3: Optimized Defaults
		F4: Save & Exit
Boot Counter	N/A	ESC: Exit
Version 2.22.1293 Copyright (C) 2024 AMI		

8.2.2. Advanced Setup Menu

The Advanced setup menu provides sub-screens and functions for advanced configurations.

NOTICE Setting items on this screen to incorrect values may cause the system to malfunction.

The following sub-screen functions are included in the menu:

- cTDP, IBECC, Audio, Compliance Test & Power Configuration
- RC ACPI Settings
- Connectivity Configuration
- CPU Configuration
- Power & Performance
- Display Configuration
- PCH-FW Configuration
- Thermal Configuration
- Platform Settings
- ACPI D3Cold Settings
- BCLK Configuration
- Intel® Time Coordinated Computing
- Functional Safety Configuration
- Debug Settings
- Debug Configuration
- Trusted Computing
- ACPI Settings
- Miscellaneous
- SMART Settings
- H/W Monitor
- S5 RTC Wake Settings
- UEFI Variables Protection
- Serial Port Console Redirection
- AMI Graphic Output Protocol Policy
- SIO Common Settings
- SIO Configuration
- PCI Subsystem Settings
- USB Configuration
- Network Stack Configuration
- CSM Configuration
- NVMe Configuration
- SDIO Configuration
- CH7513A Configurations
- F81435 Configurations
- Tls Auth Configuration
- RAM Disk Configuration

- Intel® Ethernet Controller I226-IT – C0:EA:C3:D1:D1:0E
- Intel® Ethernet Controller I226-IT – C0:EA:C3:D1:D1:0E
- Driver Health

Figure 48: BIOS Advanced Menu

Aptio Setup – AMI					
Main	**Advanced**	**Chipset**	**Security**	**Boot**	**Save & Exit**
Configurable TDP Mode			[15W]		
In-Band ECC Support			[Disabled]		
Compliance Test Mode			[Disabled]		
HD Audio			[Enabled]		
Power Mode Selection			[ATX Mode]		
Restore AC Power Loss			[Last State]		
Power Saving Mode			[Enabled]		
> RC ACPI Settings					
> Connectivity Configuration					
> CPU Configuration					
> Power & Performance					
> Display Configuration					
> PCH-FW Configuration					
> Thermal Configuration					
> Platform Settings					
> ACPI D3Cold Settings					
> BCLK Configuration					
> Intel® Time Coordinated Computing					
> Functional Safety Configuration					
> Debug Settings					
> Debug Configuration					
> Trusted Computing					
> ACPI Settings					
> Miscellaneous					
> SMART Settings					
> H/W Monitor					
> S5 RTC Wake Settings					
> UEFI Variables Protection					
> Serial Port Console Redirection					
> AMI Graphic Output Protocol Policy					
> SIO Common Setting					
> SIO Configuration					
> PCI Subsystem Settings					
> USB Configuration					
> Network Stack Configuration					

Aptio Setup – AMI					
Main	**Advanced**	**Chipset**	**Security**	**Boot**	**Save & Exit**
> CSM Configuration > NVMe Configuration > SDIO Configuration					
> CH7513A Configurations > F81435 Configurations > Tls Auth Configuration > RAM Disk Configuration > Intel® Ethernet Controller I226-IT – C0:EA:C3:D1:D1:0E > Intel® Ethernet Controller I226-IT – C0:EA:C3:D1:D1:0E > Driver Health				→ ←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit	
Version 2.22.1293 Copyright (C) 2024 AMI					

Feature	Option	Description
Configurable TDP Mode	[15W], [Deactivate]	Configurable Processor Base Power (cTDP) Mode as 15W (Nominal) / 9W (Level 1) / Deactivate TDP selection. Deactivate option will set MSR to Nominal and MMIO to Zero. This option is only available for CPU i3 SKUs.
In-Band ECC Support	[Disabled], [Enabled]	Enable / Disable In-Band ECC. Will be enabled if memory has symmetric configuration
Compliance Test Mode	[Disabled], [Enabled]	Enable when using Compliance Load Board
HD Audio	[Disabled], [Enabled]	Control Detection of the HD-Audio device. [Disabled] = HDA will be unconditionally disabled. [Enabled] = HDA will be unconditionally enabled.
Power Mode Selection	[ATX mode]	Read only item.
Restore AC Power Loss	[Power Off], [Last State]	Choose options for restoring AC power loss
Power Saving Mode	[Disabled], [Enabled]	Enable / Disable power saving mode

Figure 49: BIOS Advanced Menu – RC ACPI Settings

Aptio Setup – AMI		
Advanced		
RC ACPI Settings		
PTID Support	[Enabled]	
PECI Access Method	[Direct I/O]	
Native PCIE Enable	[Enabled]	
Native ASPM	[Auto]	
BDAT ACPI Table Support	[Disabled]	
ACPI Debug	[Disabled]	
D3 Setting for Storage	[D3Hot]	
Low Power S0 Idle Capability	[Enabled]	
PUIS Enable	[Disabled]	
EC Notification	[Enabled]	
EC CS Debug Light	[Disabled]	→←: Select Screen
EC Low Power Mode	[Enabled]	↑ ↓: Select Item
Sensor Standby	[Disabled]	Enter: Select
CS PL1 Limit	[Disabled]	+/-: Change Opt.
> PEP Constraints Configuration		F1: General Help
LPIT Residency Counter	[SLP S0]	F2: Previous Values
		F3: Optimized Defaults
PCI Delay Optimization	[Disabled]	F4: Save & Exit
MSI enabled	[Enabled]	ESC: Exit
Version 2.22.1293 Copyright (C) 2024 AMI		

Feature	Option	Description
PTID Support	[Disabled], [Enabled]	PTID Support will be loaded if enabled.
PECI Access Method	[Direct I/O], [ACPI]	PECI Access Method is Direct I/O or ACPI.
Native PCIE Enable	[Disabled], [Enabled]	Bit – PCIe Native * control 0 - ~ Hot Plug 1 – SHPC Native Hot Plug control 2 - ~ Power Management Events 3 – PCIe Advanced Error Reporting control 4 – PCIe Capability Structure control 5 – Latency Tolerance Reporting control
Native ASPM	[Auto], [Enabled], [Disabled]	[Enabled]: OS Controlled ASPM [Disabled]: BIOS Controlled ASPM

Feature	Option	Description
BDAT ACPI Table Support	[Disabled], [Enabled]	Enables support for the BDAT ACPI table.
ACPI Debug	[Disabled], [Enabled]	Open a memory buffer for storing debug strings. Reenter SETUP after enabling to see the buffer address. Use method ADBG to write strings to buffer.
D3 Setting for Storage	[Disabled], [D3Hot]	RTD3 support for storage. PCIE storage PEP constraint needs to be set as D0/F1 (Intel Advanced → ACPI Settings → PEP PCIe Storage) when this setup is disabled / D3Hot.
Low Power S0 Idle Capability	[Disabled], [Enabled]	This variable determines if we enable ACPI Lower Power S0 Idle Capability (Mutually exclusive with Smart connect). While this is enabled, it also disables 8254 timer for SLP_S0 support.
PUIS Enable	[Enabled], [Disabled]	Enable / Disable Power-Up In Standby (PUIS) feature set allows devices to be powered-up into the Standby power management state to minimize inrush current at power-up and to allow the host to sequence the spin-up of devices.
EC Notification	[Disabled], [Enabled]	Sends EC notification of Low Power S0 Idle State
EC CS Debug Light	[Disabled], [Enabled]	When EC enters Low Power S0 Idle State, the CAPS LOCK light will be turned on
EC Low Power Mode	[Disabled], [Enabled]	This option controls whether EC will go to low power mode during Low Power S0 Idle State
Sensor Standby	[Disabled], [Enabled]	Enable / Disable Sensor standby mode
CS PL1 Limit	[Disabled], [Enabled]	Limit PL1 (Power Limit 1) while in Connected Standby
LPIT Residency Counter	[C10], [SLP S0]	Select Residency Counter
PCI Delay Optimization	[Disabled], [Enabled]	Experimental ACPI additions for FW latency optimizations
MSI enabled	[Disabled], [Enabled]	When disabled, MSI support is disabled in FADT

Figure 50: BIOS Advanced Menu – RC ACPI Settings – PEP Constraints Configuration

Aptio Setup – AMI		
Advanced		
PEP Constraints Configuration		
PEP CPU	[Enabled]	
PEP Graphics	[Enabled]	
PEP IPU	[Enabled]	
PEP GNA	[Enabled]	
PEP SATA	[Adapter D3]	
PEP enumerated SATA ports	[Disabled]	
PEP PCIe Storage	[D0/F1]	
PEP PCIe LAN	[D0/F1]	
PEP PCIe WLAN	[D0/F1]	
PEP PCIe GFX	[D0/F1]	
PEP PCIe Other	[No Constraint]	
PEP UART	[Enabled]	
PEP I2C0	[Enabled]	
PEP I2C1	[Enabled]	
PEP I2C2	[Enabled]	
PEP I2C3	[Enabled]	
PEP I2C4	[Enabled]	
PEP I2C5	[Enabled]	
PEP I2C6	[Enabled]	
PEP I2C7	[Enabled]	
PEP SPI	[Enabled]	
PEP XHCI	[Enabled]	→←: Select Screen
PEP Audio	[D0/F1]	↑ ↓: Select Item
PEP CSME	[Enabled]	Enter: Select
PEP HECI3	[Enabled]	+/-: Change Opt.
PEP THC0	[Enabled]	F1: General Help
PEP THC1	[Enabled]	F2: Previous Values
PEP UPS0	[Enabled]	F3: Optimized Defaults
PEP UFS1	[Enabled]	F4: Save & Exit
PEP TCSS	[Enabled]	ESC: Exit
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Feature	Option	Description
PEP CPU	[Disabled], [Enabled]	Add CPU in PEP mitigation list
PEP Graphics	[Disabled], [Enabled]	Add Gfx in PEP mitigation list

Feature	Option	Description
PEP IPU	[Disabled], [Enabled]	Add IPU in PEP mitigation list
PEP GNA	[Disabled], [Enabled]	Add GNA in PEP mitigation list
PEP SATA	[No Constraint], [Adapter D0/F1], [Raid Volume 0], [Adapter D3]	Add Storage device in PEP mitigation list
PEP enumerated SATA ports	[Disabled], [Enabled]	Add enumerated SATA ports in PEP Constraint list
PEP PCIe Storage	[No Constraint], [D0/F1], [D3]	Add PCIe root ports (storage) in PEP mitigation list
PEP PCIe LAN	[No Constraint], [D0/F1], [D3]	Add PCIe root ports (LAN) in PEP mitigation list
PEP PCIe WLAN	[No Constraint], [D0/F1], [D3]	Add PCIe root ports (WLAN) in PEP mitigation list
PEP PCIe GFX	[No Constraint], [D0/F1], [D3]	Add PCIe root ports (GFX) in PEP mitigation list
PEP PCIe Other	[No Constraint], [D0/F1], [D3]	Add PCIe root ports (Other) in PEP mitigation list
PEP UART	[Disabled], [Enabled]	Add UART in PEP mitigation list
PEP I2C0..7	[Enabled]	Read only item
PEP SPI	[Disabled], [Enabled]	Add SPI in PEP mitigation list
PEP XHCI	[Disabled], [Enabled]	Add XHCI in PEP mitigation list
PEP Audio	[No Constraint], [D0/F1], [D3]	Add Audio in PEP mitigation list
PEP CSME	[Disabled], [Enabled]	Add CSME in PEP mitigation list
PEP HECI3	[Disabled], [Enabled]	Add HECI3 in PEP mitigation list
PEP THC0/1	[Disabled], [Enabled]	Add THC in PEP mitigation list. Applies only if THCx has assigned port.
PEP UFS0/1	[Disabled], [Enabled]	Add UFSx IPs in PEP mitigation list

Feature	Option	Description
PEP TCSS	[Disabled], [Enabled]	Add TCSS IPs in PEP mitigation list

Figure 51: BIOS Advanced Menu – Connectivity Configuration

Aptio Setup – AMI		
Advanced		
CNVi CRF Present		
CNVi Configuration		
CNVi Mode	[Auto Detection]	
Wi-Fi Core*	[Enabled]	
BT Core*	[Enabled]	
BT Audio Offload*	[Enabled]	
BT RF-Kill Delay Time*	0	
RFI Mitigation	[Enabled]	
CoExistence Manager	[Disabled]	
Discrete Bluetooth Interface	[USB]	
BT Interrupt Mode**	[GPIO Interrupt]	
BT Tile Mode	[Disabled]	
Advanced settings	[Disabled]	
Switched Antenna Diversity Selection#	[Diversity]	
SPLC#		
Domain Type SPLC 1#	7	
Default Power Limit#	65535	
Default Time Window#	30000	
WAND#		
TRxDelay_A#	50	
TRxCableLength_A#	50	
TRxDelay_B#	50	
TRxCableLength_B#	50	
WRDD Package 1#		
Domain Type#	7	
Country Identifier#	16720	
11Ax Control#		
11Ax Setting for Ukraine#	[Disabled]	
11Ax Mode for Ukraine#	[Disabled]	
11Ax Setting for Russia#	[Disabled]	
11Ax Mode for Russia#	[Disabled]	
WRDS Package#		
WiFi SAR#	[Disabled]	
SAR 2400 MHz Set1 Chain A#	0	
SAR 5150-5350 MHz Set1 Chain A#	0	
SAR 5350-5470 MHz Set1 Chain A#	0	

Aptio Setup – AMI		
Advanced		
SAR 5470-5725 MHz Set1 Chain A#	0	
SAR 5725-5925 MHz Set1 Chain A#	0	
SAR 5945-6165 MHz Set1 Chain A#	0	
SAR 6165-6405 MHz Set1 Chain A#	0	
SAR 6405-6525 MHz Set1 Chain A#	0	
SAR 6525-6705 MHz Set1 Chain A#	0	
SAR 6705-6865 MHz Set1 Chain A#	0	
SAR 6865-7105 MHz Set1 Chain A#	0	
SAR 2400 MHz Set1 Chain B#	0	
SAR 5150-5350 MHz Set1 Chain B#	0	
SAR 5350-5470 MHz Set1 Chain B#	0	
SAR 5470-5725 MHz Set1 Chain B#	0	
SAR 5725-5925 MHz Set1 Chain B#	0	
SAR 5945-6165 MHz Set1 Chain B#	0	
SAR 6165-6405 MHz Set1 Chain B#	0	
SAR 6405-6525 MHz Set1 Chain B#	0	
SAR 6525-6705 MHz Set1 Chain B#	0	
SAR 6705-6865 MHz Set1 Chain B#	0	
SAR 6865-7105 MHz Set1 Chain B#	0	
SAR CDB 2400 MHz Set1 Chain A#	0	
SAR CDB 5150-5350 MHz Set1 Chain A#	0	
SAR CDB 5350-5470 MHz Set1 Chain A#	0	
SAR CDB 5470-5725 MHz Set1 Chain A#	0	
SAR CDB 5725-5925 MHz Set1 Chain A#	0	
SAR CDB 5945-6165 MHz Set1 Chain A#	0	
SAR CDB 6165-6405 MHz Set1 Chain A#	0	
SAR CDB 6405-6525 MHz Set1 Chain A#	0	
SAR CDB 6525-6705 MHz Set1 Chain A#	0	
SAR CDB 6705-6865 MHz Set1 Chain A#	0	
SAR CDB 6865-7105 MHz Set1 Chain A#	0	
SAR CDB 2400 MHz Set1 Chain B#	0	
SAR CDB 5150-5350 MHz Set1 Chain B#	0	
SAR CDB 5350-5470 MHz Set1 Chain B#	0	
SAR CDB 5470-5725 MHz Set1 Chain B#	0	
SAR CDB 5725-5925 MHz Set1 Chain B#	0	
SAR CDB 5945-6165 MHz Set1 Chain B#	0	
SAR CDB 6165-6405 MHz Set1 Chain B#	0	
SAR CDB 6405-6525 MHz Set1 Chain B#	0	
SAR CDB 6525-6705 MHz Set1 Chain B#	0	
SAR CDB 6705-6865 MHz Set1 Chain B#	0	

Aptio Setup – AMI		
Advanced		
SAR CDB 6865-7105 MHz Set1 Chain B#	0	
EWRD Package#		
WiFi Dynamic SAR#	[Disabled]	
Extended SAR Range Sets#	[No Additional sets]	
SAR 2400 MHz Set2 Chain A#	0	
SAR 5150-5350 MHz Set2 Chain A#	0	
SAR 5350-5470 MHz Set2 Chain A#	0	
SAR 5470-5725 MHz Set2 Chain A#	0	
SAR 5725-5925 MHz Set2 Chain A#	0	
SAR 5945-6165 MHz Set2 Chain A#	0	
SAR 6165-6405 MHz Set2 Chain A#	0	
SAR 6405-6525 MHz Set2 Chain A#	0	
SAR 6525-6705 MHz Set2 Chain A#	0	
SAR 6705-6865 MHz Set2 Chain A#	0	
SAR 6865-7105 MHz Set2 Chain A#	0	
SAR 2400 MHz Set2 Chain B#	0	
SAR 5150-5350 MHz Set2 Chain B#	0	
SAR 5350-5470 MHz Set2 Chain B#	0	
SAR 5470-5725 MHz Set2 Chain B#	0	
SAR 5725-5925 MHz Set2 Chain B#	0	
SAR 5945-6165 MHz Set2 Chain B#	0	
SAR 6165-6405 MHz Set2 Chain B#	0	
SAR 6405-6525 MHz Set2 Chain B#	0	
SAR 6525-6705 MHz Set2 Chain B#	0	
SAR 6705-6865 MHz Set2 Chain B#	0	
SAR 6865-7105 MHz Set2 Chain B#	0	
SAR 2400 MHz Set3 Chain A#	0	
SAR 5150-5350 MHz Set3 Chain A#	0	
SAR 5350-5470 MHz Set3 Chain A#	0	
SAR 5470-5725 MHz Set3 Chain A#	0	
SAR 5725-5925 MHz Set3 Chain A#	0	
SAR 5945-6165 MHz Set3 Chain A#	0	
SAR 6165-6405 MHz Set3 Chain A#	0	
SAR 6405-6525 MHz Set3 Chain A#	0	
SAR 6525-6705 MHz Set3 Chain A#	0	
SAR 6705-6865 MHz Set3 Chain A#	0	
SAR 6865-7105 MHz Set3 Chain A#	0	
SAR 2400 MHz Set3 Chain B#	0	
SAR 5150-5350 MHz Set3 Chain B#	0	
SAR 5350-5470 MHz Set3 Chain B#	0	

Aptio Setup – AMI		
Advanced		
SAR 5470-5725 MHz Set3 Chain B#	0	
SAR 5725-5925 MHz Set3 Chain B#	0	
SAR 5945-6165 MHz Set3 Chain B#	0	
SAR 6165-6405 MHz Set3 Chain B#	0	
SAR 6405-6525 MHz Set3 Chain B#	0	
SAR 6525-6705 MHz Set3 Chain B#	0	
SAR 6705-6865 MHz Set3 Chain B#	0	
SAR 6865-7105 MHz Set3 Chain B#	0	
SAR 2400 MHz Set4 Chain A#	0	
SAR 5150-5350 MHz Set4 Chain A#	0	
SAR 5350-5470 MHz Set4 Chain A#	0	
SAR 5470-5725 MHz Set4 Chain A#	0	
SAR 5725-5925 MHz Set4 Chain A#	0	
SAR 5945-6165 MHz Set4 Chain A#	0	
SAR 6165-6405 MHz Set4 Chain A#	0	
SAR 6405-6525 MHz Set4 Chain A#	0	
SAR 6525-6705 MHz Set4 Chain A#	0	
SAR 6705-6865 MHz Set4 Chain A#	0	
SAR 6865-7105 MHz Set4 Chain A#	0	
SAR 2400 MHz Set4 Chain B#	0	
SAR 5150-5350 MHz Set4 Chain B#	0	
SAR 5350-5470 MHz Set4 Chain B#	0	
SAR 5470-5725 MHz Set4 Chain B#	0	
SAR 5725-5925 MHz Set4 Chain B#	0	
SAR 5945-6165 MHz Set4 Chain B#	0	
SAR 6165-6405 MHz Set4 Chain B#	0	
SAR 6405-6525 MHz Set4 Chain B#	0	
SAR 6525-6705 MHz Set4 Chain B#	0	
SAR 6705-6865 MHz Set4 Chain B#	0	
SAR 6865-7105 MHz Set4 Chain B#	0	
SAR CDB 2400 MHz Set2 Chain A#	0	
SAR CDB 5150-5350 MHz Set2 Chain A#	0	
SAR CDB 5350-5470 MHz Set2 Chain A#	0	
SAR CDB 5470-5725 MHz Set2 Chain A#	0	
SAR CDB 5725-5925 MHz Set2 Chain A#	0	
SAR CDB 5945-6165 MHz Set2 Chain A#	0	
SAR CDB 6165-6405 MHz Set2 Chain A#	0	
SAR CDB 6405-6525 MHz Set2 Chain A#	0	
SAR CDB 6525-6705 MHz Set2 Chain A#	0	
SAR CDB 6705-6865 MHz Set2 Chain A#	0	

Aptio Setup – AMI		
Advanced		
SAR CDB 6865-7105 MHz Set2 Chain A#	0	
SAR CDB 2400 MHz Set2 Chain B#	0	
SAR CDB 5150-5350 MHz Set2 Chain B#	0	
SAR CDB 5350-5470 MHz Set2 Chain B#	0	
SAR CDB 5470-5725 MHz Set2 Chain B#	0	
SAR CDB 5725-5925 MHz Set2 Chain B#	0	
SAR CDB 5945-6165 MHz Set2 Chain B#	0	
SAR CDB 6165-6405 MHz Set2 Chain B#	0	
SAR CDB 6405-6525 MHz Set2 Chain B#	0	
SAR CDB 6525-6705 MHz Set2 Chain B#	0	
SAR CDB 6705-6865 MHz Set2 Chain B#	0	
SAR CDB 6865-7105 MHz Set2 Chain B#	0	
SAR CDB 2400 MHz Set3 Chain A#	0	
SAR CDB 5150-5350 MHz Set3 Chain A#	0	
SAR CDB 5350-5470 MHz Set3 Chain A#	0	
SAR CDB 5470-5725 MHz Set3 Chain A#	0	
SAR CDB 5725-5925 MHz Set3 Chain A#	0	
SAR CDB 5945-6165 MHz Set3 Chain A#	0	
SAR CDB 6165-6405 MHz Set3 Chain A#	0	
SAR CDB 6405-6525 MHz Set3 Chain A#	0	
SAR CDB 6525-6705 MHz Set3 Chain A#	0	
SAR CDB 6705-6865 MHz Set3 Chain A#	0	
SAR CDB 6865-7105 MHz Set3 Chain A#	0	
SAR CDB 2400 MHz Set3 Chain B#	0	
SAR CDB 5150-5350 MHz Set3 Chain B#	0	
SAR CDB 5350-5470 MHz Set3 Chain B#	0	
SAR CDB 5470-5725 MHz Set3 Chain B#	0	
SAR CDB 5725-5925 MHz Set3 Chain B#	0	
SAR CDB 5945-6165 MHz Set3 Chain B#	0	
SAR CDB 6165-6405 MHz Set3 Chain B#	0	
SAR CDB 6405-6525 MHz Set3 Chain B#	0	
SAR CDB 6525-6705 MHz Set3 Chain B#	0	
SAR CDB 6705-6865 MHz Set3 Chain B#	0	
SAR CDB 6865-7105 MHz Set3 Chain B#	0	
SAR CDB 2400 MHz Set4 Chain A#	0	
SAR CDB 5150-5350 MHz Set4 Chain A#	0	
SAR CDB 5350-5470 MHz Set4 Chain A#	0	
SAR CDB 5470-5725 MHz Set4 Chain A#	0	
SAR CDB 5725-5925 MHz Set4 Chain A#	0	
SAR CDB 5945-6165 MHz Set4 Chain A#	0	

Aptio Setup – AMI		
Advanced		
SAR CDB 6165-6405 MHz Set4 Chain A#	0	
SAR CDB 6405-6525 MHz Set4 Chain A#	0	
SAR CDB 6525-6705 MHz Set4 Chain A#	0	
SAR CDB 6705-6865 MHz Set4 Chain A#	0	
SAR CDB 6865-7105 MHz Set4 Chain A#	0	
SAR CDB 2400 MHz Set4 Chain B#	0	
SAR CDB 5150-5350 MHz Set4 Chain B#	0	
SAR CDB 5350-5470 MHz Set4 Chain B#	0	
SAR CDB 5470-5725 MHz Set4 Chain B#	0	
SAR CDB 5725-5925 MHz Set4 Chain B#	0	
SAR CDB 5945-6165 MHz Set4 Chain B#	0	
SAR CDB 6165-6405 MHz Set4 Chain B#	0	
SAR CDB 6405-6525 MHz Set4 Chain B#	0	
SAR CDB 6525-6705 MHz Set4 Chain B#	0	
SAR CDB 6705-6865 MHz Set4 Chain B#	0	
SAR CDB 6865-7105 MHz Set4 Chain B#	0	
WGDS Package#		
SAR 2400 MHz Max Allowed for Group 1 (FCC) #	255	
SAR 2400 MHz Chain A Offset for Group 1 (FCC) #	0	
SAR 2400 MHz Chain B Offset for Group 1 (FCC) #	0	
SAR 5200 MHz Max Allowed for Group 1 (FCC) #	255	
SAR 5200 MHz Chain A Offset for Group 1 (FCC) #	0	
SAR 5200 MHz Chain B Offset for Group 1 (FCC) #	0	
SAR 6000-7000 MHz Max Allowed for Group 1 (FCC) #	255	
SAR 6000-7000 MHz Chain A Offset for Group 1 (FCC) #	0	
SAR 6000-7000 MHz Chain B Offset for Group 1 (FCC) #	0	
SAR 2400 MHz Max Allowed for Group 2 (EU Japan) #	255	
SAR 2400 MHz Chain A Offset for Group 2 (EU Japan) #	0	
SAR 2400 MHz Chain B Offset for Group 2 (EU Japan) #	0	
SAR 5200 MHz Max Allowed for Group 2 (EU Japan) #	255	
SAR 5200 MHz Chain A Offset for Group 2 (EU Japan) #	0	
SAR 5200 MHz Chain B Offset for Group 2 (EU Japan) #	0	

Aptio Setup – AMI		
Advanced		
SAR 6000-7000 MHz Max Allowed for Group 2 (EU Japan) #	255	
SAR 6000-7000 MHz Chain A Offset for Group 2 (EU Japan) #	0	
SAR 6000-7000 MHz Chain B Offset for Group 2 (EU Japan) #	0	
SAR 2400 MHz Max Allowed for Group 3 (ROW) #	255	
SAR 2400 MHz Chain A Offset for Group 3 (ROW) #	0	
SAR 2400 MHz Chain B Offset for Group 3 (ROW) #	0	
SAR 5200 MHz Max Allowed for Group 3 (ROW) #	255	
SAR 5200 MHz Chain A Offset for Group 3 (ROW) #	0	
SAR 5200 MHz Chain B Offset for Group 3 (ROW) #	0	
SAR 6000-7000 MHz Max Allowed for Group 3 (ROW) #	255	
SAR 6000-7000 MHz Chain A Offset for Group 3 (ROW) #	0	
SAR 6000-7000 MHz Chain B Offset for Group 3 (ROW) #	0	
External 32KHz Clock#	[Not Valid]	
PPAG Package#		
WiFi ANT Gain control#	[Disabled]	
Ant Gain 2400 MHz Chain A#	24	
Ant Gain 5150-5350 MHz Chain A#	40	
Ant Gain 5350-5470 MHz Chain A#	40	
Ant Gain 5470-5725 MHz Chain A#	40	
Ant Gain 5725-5945 MHz Chain A#	40	
Ant Gain 5945-6165 MHz Chain A#	40	
Ant Gain 6165-6405 MHz Chain A#	40	
Ant Gain 6405-6525 MHz Chain A#	40	
Ant Gain 6525-6705 MHz Chain A#	40	
Ant Gain 6705-6865 MHz Chain A#	40	
Ant Gain 6865-7105 MHz Chain A#	40	
Ant Gain 2400 MHz Chain B#	24	
Ant Gain 5150-5350 MHz Chain B#	40	
Ant Gain 5350-5470 MHz Chain B#	40	
Ant Gain 5470-5725 MHz Chain B#	40	
Ant Gain 5725-5945 MHz Chain B#	40	
Ant Gain 5945-6165 MHz Chain B#	40	

Aptio Setup – AMI		
Advanced		
Ant Gain 6165-6405 MHz Chain B#	40	
Ant Gain 6405-6525 MHz Chain B#	40	
Ant Gain 6525-6705 MHz Chain B#	40	
Ant Gain 6705-6865 MHz Chain B#	40	
Ant Gain 6865-7105 MHz Chain B#	40	
Bluetooth SAR#	[Disabled]	
Bluetooth SAR BR#	0	
Bluetooth SAR EDR2#	0	
Bluetooth SAR EDR3#	0	
Bluetooth SAR LE#	0	
Bluetooth SAR LE 2Mhz#	0	
Bluetooth SAR LE LR#	0	
Disable SRD Active Channels#	0	
Supported Indonesia 5.15-5.35 GHz Band#	0	
Ultra High Band Support#	0	
Regulatory Configurations#	[Disable DRS for China Location]	
UART Configurations#	[Default]	
UNII-4#	0	
Indoor Control#	0	
Wi-Fi Time Average SAR – WTAS#		→←: Select Screen
WTAS Selection#	[Disabled]	↑ ↓: Select Item
WTAS List Entries#	0	Enter: Select
ISO country code to block#	0	+/-: Change Opt.
:		F1: General Help
:		F2: Previous Values
ISO country code to block#	0	F3: Optimized Defaults
		F4: Save & Exit
> WWAN Configuration		ESC: Exit
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* These items appear only when selecting [Auto Detection] for CNVi Mode.
** This item appears only when selecting [UART] for Discrete Bluetooth Interface.
# These items appear only when enabling Advanced Settings.

Feature	Option	Description
CNVi Mode	[Disable Integrated], [Auto Detection]	This option configures Connectivity. [Auto Detection] means that if Discrete solution is discovered it will be enabled by default. Otherwise Integrated solution (CNVi) will be enabled; [Disable Integrated] disables Integrated Solution.

Feature	Option	Description
		Note: When CNVi is present, the GPIO pins that are used for radio interface cannot be assigned to the other native function.
Wi-Fi Core	[Enabled]	Read only item
BT Core	[Enabled]	Read only item
BT Audio Offload	[Enabled]	Read only item
BT RF-Kill Delay Time	0	Read only item
RFI Mitigation	[Enabled], [Disabled]	This is an option intended to Enable / Disable DDR-RFIM feature for Connectivity. This RFI mitigation feature may result in temporary slowdown of the DDR speed.
CoExistence Manager	[Disabled]	Read only item
Discrete Bluetooth Interface	[Disabled], [USB], [UART]	Serial IO UART0 needs to be enabled to select BT interface
BT Interrupt Mode	[GPIO Interrupt], [APIC Interrupt]	Selects routing of interrupt from BT Module
BT Tile Mode	[Disabled], [Enabled]	Enable / Disable Tile
Advanced settings	[Disabled], [Enabled]	Configure ACPI objects for wireless devices
Switched Antenna Diversity Selection	[Antenna1], [Antenna2], [Diversity], [Diversity Antenna1], [Diversity Antenna2]	This allows WiFi modules which have only one antenna to use one of the 2 possible antennas with the options: 0 – Antenna1 1 – Antenna2 2 – Diversity 3 – Diversity Antenna1 4 – Diversity Antenna2
Domain Type SPLC 1	Value input	09h: Module (M.2); 07h: WiFi / WLAN; 0Fh: WWAN; 10h: WiGig; 14h: RFEM
Default Power Limit	Value input	Power Limit in milli watts
Default Time Window	Value input	Time Window in milli seconds
TRxDelay_A / B	Value input	Antenna A / B delay possible values: 1-100 in 10ths of nano seconds resolution
TrxCableLength_A / B	Value input	Antenna A / B cable length possible values: 1-100 cm in 1 cm resolution
11Ax Setting for Ukraine	[Disabled], [Enabled]	11Ax Setting for Ukraine Bit 2 – Apply changes to country Ukraine. 11Ax Setting within module certification 00 – None. Work with Wi-Fi FW/OTP definitions [Default] 01 – Apply changes
11Ax Mode for Ukraine	[Disabled],	11Ax Mode for Ukraine

Feature	Option	Description
	[Enabled]	Bit 1 – 11Ax Mode. Effective only if Bit 0 set to 1 00 – Disable 11Ax on country Ukraine [Default] 01 – Enable 11Ax on country Ukraine
11Ax Setting for Russia	[Disabled], [Enabled]	11Ax Setting for Russia Bit 2 – Apply changes to country Russia. 11Ax Setting within module certification 00 – None. Work with Wi-Fi FW/OTP definitions [Default] 01 – Apply changes
11Ax Mode for Russia	[Disabled], [Enabled]	11Ax Mode for Russia Bit 3 – 11Ax Mode. Effective only if Bit 2 set to 1 00 – Disable 11Ax on country Russia [Default] 01 – Enable 11Ax on country Russia
WiFi SAR	[Disabled], [Enabled]	Enable / Disable WiFi SAR Tx Power Limit; [Disabled]: Device ignores WiFi SAR Configuration Table; [Enabled]; Device uses WiFi SAR Configuration Table.
SAR 2400 / 5150-5350 / .. / 6865-7105 MHz Set 1 Chain A / B	Value input	Defines the WiFi SAR Tx Power Limit – 8bit unsigned with 5bit integer and 3bit fractional. 0x00 = 0b00000000 = 0.125dB; 0xFF = 0b11111111 = 31.875dB. Each step is equivalent to 0.125dB
SAR CDB 2400 / 5150-5350 / .. / 6865-7105 MHz Set 1 Chain A / B	Value input	Defines the WiFi CDB SAR Tx Power Limit – 8bit unsigned with 5bit integer and 3bit fractional. 0x00 = 0b00000000 = 0.125dB; 0xFF = 0b11111111 = 31.875dB. Each step is equivalent to 0.125dB
WiFi Dynamic SAR	[Disabled], [Enabled]	Enable / Disable WiFi Dynamic SAR Tx Power Limit which shell be set dynamically accorting to the Proximity Sensor
Extended SAR Range Sets	[No Additional sets], [Set 2], [Set 3], [Set 4]	Defines the WiFi SAR Sets that can be used to set the power limts dynamically based on the Proximity Sensor, Set 1 is always present if WiFi SAR enabled and Set 2-3 are additional sets.
SAR 2400 / 5150-5350 / .. / 6865-7105 MHz Set 2 / 3 / 4 Chain A / B	Value input	Defines the WiFi SAR Tx Power Limit – 8bit unsigned with 5bit integer and 3bit fractional. 0x00 = 0b00000000 = 0.125dB; 0xFF = 0b11111111 = 31.875dB. Each step is equivalent to 0.125dB
SAR CDB 2400 / 5150-5350 / .. / 6865-7105 MHz Set 2 / 3 / 4 Chain A / B	Value input	Defines the WiFi CDB SAR Tx Power Limit – 8bit unsigned with 5bit integer and 3bit fractional. 0x00 = 0b00000000 = 0.125dB; 0xFF = 0b11111111 = 31.875dB. Each step is equivalent to 0.125dB
SAR 2400 / 5200 / 6000-7000 MHz Max Allowed for Group 1 / 2 / 3 (FCC / EU Japan / ROW)	Value input	Defines the WiFi SAR Delta Value to be applied – 8bit unsigned with 5bit integer and 3bit fractional. 0x00 = 0b00000000 = 0.125dB; 0xFF = 0b11111111 = 31.875dB. Each step is equivalent to 0.125dB
SAR 2400 / 5200 / 6000-7000 MHz Chain A Offset for Group 1 / 2 / 3 (FCC / EU Japan / ROW)	Value input	Defines the WiFi SAR Delta Value to be applied – 8bit unsigned with 5bit integer and 3bit fractional. 0x00 = 0b00000000 = 0.125dB; 0xFF = 0b11111111 = 31.875dB. Each step is equivalent to 0.125dB

Feature	Option	Description
SAR 2400 / 5200 / 6000-7000 MHz Chain B Offset for Group 1 / 2 / 3 (FCC / EU Japan / ROW)	Value input	Defines the WiFi SAR Tx Power Limit – 8bit unsigned with 5bit integer and 3bit fractional. 0x00 = 0b00000000 = 0.125dB; 0xFF = 0b11111111 = 31.875dB. Each step is equivalent to 0.125dB
External 32KHz Clock	[Not Valid], [Valid]	This will be used to specify that platform does have valid External 32KHz clock or not.
ANT Gain 2400 / 5150-5350 / .. / 6865-7105 MHz Chain A / B	Value input	Defines the WiFi ANT gain Delta Value to be supplied – 8bit signed Two's complement 0.125dB. 0x80 = 0b10000000 = -16dB; 0x7F = 0b01111111 = 15.875dB. Each step is equivalent to 0.125dB
Bluetooth SAR	[Disabled], [Enabled]	Define the mode of SAR control to be used. [Disabled]: Tx power shall be mandated by device NVM [Enabled]: Tx power shall be the minimum between BIOS SAR table and BT Device NVM (either Module or Platform)
Bluetooth SAR BR / EDR2 / EDR3 / LE / LE 2Mhz / LE LR	Value input	Defines the SAR power restriction for BR / EDR2 / EDR3 / LE / LE 2Mhz / LE LR Modulation
Disable SRD Active Channels	Value input	Enable / Disable SRD Active Channels 00 – ETSI 5.8 GHz SRD Active Scan Enable 01 – ETSI 5.8 GHz SRD Passive Scan Enable 02 – ETSI 5.8 GHz SRD Disabled
Supported Indonesia 5.15-5.35 GHz Band	Value input	Enable / Disable Indonesia 5.15-5.35 GHz 00 – Set 5.15-5.35 GHz to Disable in Indonesia 01 – Set 5.15-5.35 GHz to Enable (Passive) in Indonesia 02 – Reserved
Ultra High Band Support	Value input	Please input HEX value. Bit0 '0' No override [Default] '1' Only allow countries enabled in the following bits Bit1 – USA '0' USA 6GHz disable '1' 6GHz allowed in USA Bit2 – Rest of World Bit3 – EU countries Bit4 – South Korea Bit5 – Brazil Bit6 – Chile Bit7 – Japan Bit8 – Canada Bit31:9 – Reserved
Regulatory Configurations	[Disable DRS for China Location], [Enable DRS for China Location]	Enabling DRS for China Location

Feature	Option	Description
UART Configurations	[Default]	TBD
UNII-4	Value input	Control Enablement UNII-4 over certificate modules Please input HEX value. FCC Bit0 – Apply changes over FCC, UNII-4 setting within module certification (Default Intel module definitions) '0' Work with WiFi FW/OTP definitions '1' Apply changes Bit1 – UNII-4 mode on FCC '0' Disable UNII-4 '1' Enable UNII-4 ETSI Bit2 – Apply changes over ETSI, UNII-4 setting within module certification (Default Intel module definition) Bit3 – UNII-4 mode on ETSI Bit31:4 – Reserved shall set to Zeros
Indoor Control	Value input	Device for Indoor Use Only (Solar Family onwards) Please input HEX value. Bit0 – EU Bit1 – Japan Bit2 – China, applied only in case of China BIOS or DRS in China Enabled Bit3 – USA Bit31:4 – Reserved shall set to Zeros
WTAS Selection	[Disabled], [Enabled]	Enable / Disable WTAS
WTAS List Entries	Value input	No. of blocked countries not approved by OEM to support this feature.
ISO country code to block	Country code input	The decimal equivalent of country code (a two-ASCII-character) as specified in ISO_3166-1. Ex. For JP – 19024

Figure 52: BIOS Advanced Menu – Connectivity Configuration – WWAN Configuration

Aptio Setup – AMI		
Advanced		
WWAN Device	[Disabled]	
Firmware Flash Device (1) (2)	[Disabled]	
Wireless CNV Config Device (1) (2)	[Enabled]	→←: Select Screen
WWAN Reset Workaround (1) (2)	[Enabled]	↑ ↓: Select Item
WA – WWAN OEM SVID (2)	1CF8	Enter: Select
WA – WWAN SVID Detect Timeout (2)	0	+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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(1) These items appear only when selecting [4G – 7360/7560] for WWAN Device.
(2) This item appears only when selecting [5G – M80] for WWAN Device.

Feature	Option	Description
WWAN Device	[Disabled], [4G – 7360/7560], [5G – M80]	Select the M.2 WWAN Device options to enable 4G – 7360/7560 (Intel), 5G – M80 (MediaTek) Modems
Firmware Flash Device	[Disabled], [Enabled]	Enable or Disable WWAN Firmware Flash Device
Wireless CNV Config Device	[Disabled], [Enabled]	Enable or Disable WCCD ACPI device node
WWAN Reset Workaround	[Disabled], [Enabled]	Enabling this workaround will result in BIOS asserting FULL_CARD_POWER_OFF#, PERST# and RESET# WWAN signals before the WWAN Device Power-On Sequence is executed. Disabling it has no impact.
WA – WWAN OEM SVID	ID input	WWAN OEM Sub-Vendor ID
WA – WWAN SVID Detect Timeout	Value input	The timeout value (ms) for detecting WWAN OEM SVID. Please notice it is a workaround for OEM only.

Figure 53: BIOS Advanced Menu - CPU Configuration

Aptio Setup – AMI					
Main	**Advanced**	**Chipset**	**Security**	**Boot**	**Save & Exit**
CPU Configuration					
> Efficient-core Information					
> Performance-core Information					
ID					
Brand String					
VMX					
SMX/TXT					
TXT Crash Code					
TXT SPAD					
Boot Guard State					
Boot Guard ACM Policy Status					
Boot Guard SACM Information					
C6DRAM		[Enabled]			
CPU Flex Ratio Override		[Disabled]			
CPU Flex Ratio Settings*		15			
Hardware Prefetcher		[Enabled]			
Adjacent Cache Line Prefetch		[Enabled]			
Intel (VMX) Virtualization Technology		[Enabled]			
PECI		[Enabled]		→ ←: Select Screen	
AVX		[Enabled]		↑ ↓: Select Item	
Active Efficient-cores		[All]		Enter: Select	
BIST		[Disabled]		+/-: Change Opt.	
AP threads Idle Manner		[MWAIT Loop]		F1: General Help	
AES		[Enabled]		F2: Previous Values	
MachineCheck		[Enabled]		F3: Optimized Defaults	
MonitorMWait		[Enabled]		F4: Save & Exit	
> CPU SMM Enhancement				ESC: Exit	
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*This item is activated only when enabling CPU Flex Ratio Override.

Feature	Option	Description
C6DRAM	[Disabled], [Enabled]	Enable / Disable moving of DRAM contents to PRM memory when CPU is in C6 state
CPU Flex Ratio Override	[Disabled], [Enabled]	Enable / Disable CPU Flex Ratio Programming
CPU Flex Ratio Settings	Value input	This value must between Max Efficiency Ratio (LFM) and Maximum non-turbo ratio set by Hardware (HFM).

Feature	Option	Description
Hardware Prefetcher	[Disabled], [Enabled]	To turn on / off the MLC streamer prefetcher.
Adjacent Cache Line Prefetch	[Disabled], [Enabled]	To turn on / off prefetching of adjacent cache lines.
Intel (VMX) Virtualization Technology	[Disabled], [Enabled]	When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.
PECI	[Disabled], [Enabled]	Enable / Disable PECI
AVX	[Enabled], [Disabled]	Enable / Disable the AVX 2 Instructions. This is applicable for Performance-core only
Active Efficient-cores	[All], [3], [2], [1], [0]	Number of E-cores to enable in each processor packages. Note: Number of Cores and E-cores are looked at together. When both are {0,0}, Pcode will enable all cores.
BIST	[Disabled], [Enabled]	Enable / Disable BIST (Built-In Self Test) on reset
AP threads Idle Manner	[HALF Loop], [MWAIT Loop], [RUN Loop]	AP threads Idle Manner for waiting signal to run
AES	[Disabled], [Enabled]	Enable / Disable AES (Advanced Encryption Standard)
MachineCheck	[Disabled], [Enabled]	Enable / Disable Machine Check
MonitorMWait	[Disabled], [Enabled]	Enable / Disable MonitorMWait, if Disable MonitorMWait, the AP threads Idle Manner should not set in MWAIT Loop.

Figure 54: BIOS Advanced Menu - CPU Configuration – Efficient-core Information

Aptio Setup – AMI		
Advanced		
Efficient-core Information		
L1 Data Cache	32 KB x 4	→←: Select Screen
L1 Instruction Cache	64 KB x 4	↑ ↓: Select Item
L2 Cache	2048 KB	Enter: Select
L3 Cache	6 MB	+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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Figure 55: BIOS Advanced Menu - CPU Configuration – CPU SMM Enhancement

Aptio Setup – AMI		
Advanced		
CPU SMM Enhancement		
SMM Use Delay Indication	[Enabled]	→←: Select Screen
SMM Use Block Indication	[Enabled]	↑ ↓: Select Item
SMM Use SMM en-US Indication	[Enabled]	Enter: Select
		+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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Feature	Option	Description
SMM Use Delay Indication	[Disabled], [Enabled]	Enable / Disable usage of SMM_DELAYED MSR for MP sync in SMI
SMM Use Block Indication	[Disabled], [Enabled]	Enable / Disable usage of SMM_BLOCKED MSR for MP sync in SMI
SMM Use SMM en-US Indication	[Disabled], [Enabled]	Enable / Disable usage of SMM_ENABLE MSR for MP sync in SMI

Figure 56: BIOS Advanced Menu – Power & Performance

Aptio Setup – AMI					
Main	**Advanced**	**Chipset**	**Security**	**Boot**	**Save & Exit**
Power & Performance					
> CPU – Power Management Control				→ ←: Select Screen	
> GT – Power Management Control				↑ ↓: Select Item	
				Enter: Select	
				+/-: Change Opt.	
				F1: General Help	
				F2: Previous Values	
				F3: Optimized Defaults	
				F4: Save & Exit	
				ESC: Exit	
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Figure 57: BIOS Advanced Menu – Power & Performance – CPU – Power Management Control

Aptio Setup – AMI		
Advanced		
CPU – Power Management Control		
Boot performance mode	[Turbo Performance]	
Intel® SpeedStep™	[Enabled]	
Race To Halt (RTH)	[Enabled]	
Intel® Speed Shift Technology	[Enabled]	
Per Core P State OS control mode	[Enabled]	
HwP Autonomous Per Core P State	[Enabled]	
HwP Autonomous EPP Grouping	[Enabled]	
EPB override over PECI	[Disabled]	
HwP Lock	[Enabled]	
HDC Control	[Enabled]	
Turbo Mode	[Enabled]	
> View/Configure Turbo Options		
> CPU VR Settings		
Platform PL1 Enable	[Disabled]	
Platform PL1 Power (1)	0	
Platform PL1 Time Window (1)	[0]	
Platform PL2 Enable	[Disabled]	
Platform PL2 Power (2)	0	
Power Limit 4 Override	[Disabled]	

Aptio Setup – AMI		
Advanced		
Power Limit 4 [3]	0	
Power Limit 4 Lock [3]	[Disabled]	
C states	[Disabled]	
Enhanced C-states [4]	[Disabled]	
C-State Auto Demotion [4]	[C1]	
C-State Un-demotion [4]	[C1]	
Package C-State Demotion [4]	[Enabled]	
Package C-State Un-demotion [4]	[Enabled]	
CState Pre-Wake [4]	[Enabled]	
IO MWAIT Redirection [4]	[Disabled]	
Package C State Limit [4]	[Auto]	
C6/C7 Short Latency Control (MSR 0x60B) [4]		
Time Unit [4]	[1024 ns]	
Latency [4]	0	
C6/C7 Long Latency Control (MSR 0x60C) [4]		
Time Unit [4]	[1024 ns]	
Latency [4]	0	
C8 Latency Control (MSR 0x633) [4]		
Time Unit [4]	[1024 ns]	
Latency [4]	0	
C9 Latency Control (MSR 0x634) [4]		
Time Unit [4]	[1024 ns]	
Latency [4]	0	
C10 Latency Control (MSR 0x635) [4]		
Time Unit [4]	[1024 ns]	
Latency [4]	0	
Thermal Monitor	[Enabled]	
Interrupt Redirection Mode Selection	[Fixed Priority]	
Time MWAIT	[Disabled]	
> Custom P-state Table		
EC Turbo Control Mode	[Disabled]	
AC brick Capacity [5]	[90W AC Brick]	→←: Select Screen
EC Polling Period [5]	1	↑ ↓: Select Item
EC Guard Band Value [5]	0	Enter: Select
EC Algorithm Selection [5]	1	+/-: Change Opt.
Energy Performance Gain	[Disabled]	F1: General Help
EPG DIMM Idd3N [6]	26	F2: Previous Values
EPG DIMM Idd3P [6]	11	F3: Optimized Defaults
> Power Limit 3 Settings		F4: Save & Exit

Aptio Setup – AMI	
Advanced	
> CPU Lock Configuration	ESC: Exit
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(1) These items appear only when enbling Platform PL1 Enable.
(2) This item appears only when enbling Platform PL2 Enable.
(3) These items appear only when enbling Power Limit 4 Override.
(4) These items appear only when enbling C states.
(5) These items appear only when enbling EC Turbo Control Mode.
(6) These items are activated only when enbling Energy Performance Gain.

Feature	Option	Description
Boot performance mode	[Max Battery], [Max Non-Turbo Performance], [Turbo Performance]	Select the performance state that the BIOS will set starting from reset vector.
Intel® SpeedStep™	[Disabled], [Enabled]	Allows more than two frequency ranges to be supported.
Race To Halt (RTH)	[Disabled], [Enabled]	Enable / Disable Race To Halt feature. RTH will dynamically increase CPU frequency in order to enter pkg C-State faster to reduce overall power. (RTH is controlled through MSR 1FC bit 20)
Intel® Speed Shift Technology	[Disabled], [Enabled]	Enable / Disable Intel® Speed Shift Technology support. Enabling will expose the CPPC v2 interface to allow for hardware controlled P-states.
Per Core P State OS control mode	[Disabled], [Enabled]	Enable / Disable Per Core P state OS control mode. Disabling will set Bit 31 = 1 command 0x06. When set, the highest core request is used for all other core requests.
HwP Autonomous Per Core P State	[Disabled], [Enabled]	Disable Autonomous PCPS (Bit 30 = 1, command 0x11) Autonomous will request the same value for all cores all the time. Enable PCPS (default Bit 30 = 0, command 0x11)
HwP Autonomous EPP Grouping	[Disabled], [Enabled]	Enable EPP grouping (default Bit 29 = 0, command 0x11) Autonomous will request the same values for all cores with same EPP. Disable EPP grouping (Bit 29 = 1, command 0x11) autonomous will not necessarily request same values for all cores with same EPP.
EPB override over PECI	[Disabled], [Enabled]	Enable / Disable EPB override over PECI. Enable by sending pcode command 0x2b, subcommand 0x3 to 1. This will allow OOB EPB PECI override control.
HwP Lock	[Disabled], [Enabled]	Enable / Disable HWP Lock support in Misc Power Management MSR.
HDC Control	[Disabled], [Enabled]	This option allows HDC configuration. [Disabled]: Disable HDC.

Feature	Option	Description
		[Enabled]: Can be enabled by OS if OS native support is available.
Turbo Mode	[Disabled], [Enabled]	Enable / Disable processor Turbo Mode (requires EMTTM enabled too). AUTO means enabled.
Platform PL1 Enable	[Disabled], [Enabled]	Enable / Disable Platform Power Limit 1 programming. If this option is disabled, it activates the PL1 value to be used by the processor to limit the average power of given time window.
Platform PL1 Power	Value input	Platform Power Limit 1 Power in Milli Watts/Percent. BIOS will round to the nearest 1/8W when programming. Any value can be programmed between Max and Min Power Limits (specified by PACKAGE_POWER_SKU_MSR). For example, if 12.50W, enter 12500; if 12%, enter 12000; if 50%, enter 50000. This setting will act as the new PL1 value for the Package RAPL algorithm.
Platform PL1 Time Window	[0], [1], [2], [3], [4], [5], [6], [7], [8], [10], [12], [14], [16], [20], [24], [28], [32], [40], [48], [56], [64], [80], [96], [112], [128]	Platform Power Limit 1 Time Window value in seconds. The value may vary from 0 to 128. 0 = default values. Indicates the time window over which Platform Processor Base Power (TDP) value should be maintained.
Platform PL2 Enable	[Disabled], [Enabled]	Enable / Disable Platform Power Limit 2 programming. If this option is disabled, BIOS will program the default values for Platform Power Limit 2.
Platform PL2 Power	Value input	Platform Power Limit 2 Power in Milli Watts/Percent. BIOS will round to the nearest 1/8W when programming. Any value can be programmed between Max and Min Power Limits (specified by PACKAGE_POWER_SKU_MSR). For example, if 12.50W, enter 12500; if 12%, enter 12000; if 50%, enter 50000. This setting will act as the new PL2 value for the Package RAPL algorithm.
Power Limit 4 Override	[Disabled], [Enabled]	Enable / Disable Power Limit 4 override. If this option is disabled, BIOS will leave the default value for Power Limit 4.
Power Limit 4	Value input	Power Limit 4 in Milli Watts. BIOS will round to the nearest 1/8W when programming. For 12.50W, enter 12500. If the value is 0, BIOS leaves default value.
Power Limit 4 Lock	[Disabled], [Enabled]	Power Limit 4 MSR 601h Lock. When enabled PL4 configurations are locked during OS. When disabled PL4 configuration can be changed during OS.
C states	[Disabled], [Enabled]	Enable / Disable CPU Power Management. Allow CPU to go to C states when it's not 100% utilized.
Enhanced C-states	[Disabled], [Enabled]	Enable / Disable C1E. When enabled, CPU will switch to minimum speed when all cores enter C-State.
C-State Auto Demotion	[Disabled], [C1]	Configure C-State Auto Demotion
C-State Un-demotion	[Disabled], [C1]	Configure C-State Un-demotion

Feature	Option	Description
Package C-State Demotion	[Disabled], [Enabled]	Package C-State Demotion
Package C-State Un-demotion	[Disabled], [Enabled]	Package C-State Un-demotion
CState Pre-Wake	[Disabled], [Enabled]	[Disabled]: Sets bit 30 of POWER_CTL MSR (0x1FC) to 1 to disable the CState Pre-Wake
IO MWAIT Redirection	[Disabled], [Enabled]	When set, will map IO_read instructions sent to IO registers PMG_IO_BASE_ADDRBASE+offset to MWAIT (offset)
Package C State Limit	[C0/C1], [C2], [C3], [C6], [C7], [C7S], [C8], [C9], [C10], [CPU Default], [Auto]	Maximum Package C State Limit Setting. [CPU Default]: Leaves to Factory default value. [Auto]: Initializes to deepest available Package C State Limit.
Time Unit	[1 ns], [32 ns], [1024 ns], [32768 ns], [1048576 ns], [33554432 ns]	Unit of measurement for IRTL value – bits [12:10]
Latency	Value input	Interrupt Response Time Limit value – bits [9:0], Enter 0-1023
Thermal Monitor	[Disabled], [Enabled]	Enable / Disable Thermal Monitor
Interrupt Redirection Mode Selection	[Fixed Priority], [Round Robin], [Hash Vector], [No Change]	Interrupt Redirection Mode Select for Logical Interrupts
Timed MWAIT	[Disabled], [Enabled]	Enable / Disable Timed MWAIT Support
EC Turbo Control Mode	[Disabled], [Enabled]	Enable / Disable EC Turbo Control mode
Energy Performance Gain	[Disabled], [Enabled]	Enable / Disable Energy Performance Gain.
EPG DIMM Idd3N	Value input	Active standby current (Idd3N) in milliamps from datasheet. Must be calculated on a per DIMM basis.
EPG DIMM Idd3P	Value input	Active power-down current (Idd3P) in milliamps from datasheet. Must be calculated on a per DIMM basis.

Figure 58: BIOS Advanced Menu – Power & Performance – CPU – Power Management Control – View/Configure Turbo Options

Aptio Setup – AMI		
Advanced		
Current Turbo Settings		
Max Turbo Power Limit	4095.875	
Min Turbo Power Limit	0.0	
Package TDP Limit	9.0	
Power Limit 1	9.0	
Power Limit 2	25.0	
> Turbo Ratio Limit Options		→←: Select Screen
Energy Efficient P-state	[Enabled]	↑ ↓: Select Item
Package Power Limit MSR Lock	[Disabled]	Enter: Select
Power Limit 1 Override	[Disabled]	+/-: Change Opt.
Power Limit 1*	0	F1: General Help
Power Limit 1 Time Window*	[0]	F2: Previous Values
Power Limit 2 Override	[Disabled]	F3: Optimized Defaults
Power Limit 2**	0	F4: Save & Exit
Energy Efficient Turbo	[Enabled]	ESC: Exit
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*Appear only when enabling Power Limit 1 Override / ** Appears only when enabling Power Limit 2 Override.

Feature	Option	Description
Energy Efficient P-state	[Disabled], [Enabled]	Enable / Disable Energy Efficient P-state feature. When set to 0, will disable access to ENERGY_PERFORMANCE_BIAS MSR and CPUID Function 6 ECX[3] will read 0 indicating no support for Energy Efficient policy setting. When set to 1, will enable access to ENERGY_PERFORMANCE_BIAS MSR 1B0h and CPUID Function 6 ECX[3] will read 1 indicating Energy Efficient policy setting is supported.
Package Power Limit MSR Lock	[Disabled], [Enabled]	Enable / Disable locking of Package Power Limit settings. When enabled, PACKAGE_POWER_LIMIT MSR will be locked and a reset will be required to unlock the register.
Power Limit 1 Override	[Disabled], [Enabled]	Enable / Disable Power Limit 1 override. If this option is disabled, BIOS will program the default values for Power Limit 1 and Power Limit 1 Time Window.
Power Limit 1	Value input	Power Limit 1 in Milli Watts. BIOS will round to the nearest 1/8W when programming. 0 = no custom override. For 12.50W, enter 12500. Overclocking SKU: Value must be between Max and Min Power Limits (specified by PACKAGE_POWER_SKU_MSR).

Feature	Option	Description
		Other SKUs: This value must be between Min Power Limit and Processor Base Power (TDP) Limit. If value is 0, BIOS will program Processor Base Power (TDP) value.
Power Limit 1 Time Window	[0], [1], [2], [3], [4], [5], [6], [7], [8], [10], [12], [14], [16], [20], [24], [28], [32], [40], [48], [56], [64], [80], [96], [112], [128]	Power Limit 1 Time Window value in seconds. The value may vary from 0 to 128. 0 = default values (28 sec for Mobile and 8 sec for Desktop). Defines time window which Processor Base Power (TDP) value should be maintained.
Power Limit 2 Override	[Disabled], [Enabled]	Enable / Disable Power Limit 2 override. If this option is disabled, BIOS will program the default values for Power Limit 2.
Power Limit 2	Value input	Power Limit 2 value in Milli Watts. BIOS will round to the nearest 1/8W when programming. If the value is 0, BIOS will program this value as 1.25 * Processor Base Power (TDP). For 12.50W, enter 12500. Processor applies control policies such that the package power does not exceed this limit.
Energy Efficient Turbo	[Disabled], [Enabled]	Enable / Disable Energy Efficient Turbo Feature. This feature will opportunistically lower the turbo frequency to increase efficiency. Recommended only to disable in overclocking situations where turbo frequency must remain constant. Otherwise, leave enabled.

Figure 59: BIOS Advanced Menu – Power & Performance – CPU – Power Management Control – View/Configure Turbo Options – Turbo Ratio Limit Options

Aptio Setup – AMI		
Advanced		
Current Turbo Ratio Limit Settings		
E-core Turbo Ratio Limit Numcore0	1	
E-core Turbo Ratio Limit Numcore1	2	
E-core Turbo Ratio Limit Numcore2	3	
E-core Turbo Ratio Limit Numcore3	4	
E-core Turbo Ratio Limit Numcore4	5	
E-core Turbo Ratio Limit Numcore5	6	
E-core Turbo Ratio Limit Numcore6	7	
E-core Turbo Ratio Limit Numcore7	8	
E-core Turbo Ratio Limit Ratio0	34	
E-core Turbo Ratio Limit Ratio1	33	
E-core Turbo Ratio Limit Ratio2	27	
E-core Turbo Ratio Limit Ratio3	27	
E-core Turbo Ratio Limit Ratio4	27	

Aptio Setup – AMI		
Advanced		
E-core Turbo Ratio Limit Ratio5	27	
E-core Turbo Ratio Limit Ratio6	27	
E-core Turbo Ratio Limit Ratio7	27	
E-core Turbo Ratio Limit Numcore0	1	
E-core Turbo Ratio Limit Numcore1	2	
E-core Turbo Ratio Limit Numcore2	3	
E-core Turbo Ratio Limit Numcore3	4	
E-core Turbo Ratio Limit Numcore4	5	
E-core Turbo Ratio Limit Numcore5	6	
E-core Turbo Ratio Limit Numcore6	7	
E-core Turbo Ratio Limit Numcore7	8	→←: Select Screen
E-core Turbo Ratio Limit Ratio0	34	↑ ↓: Select Item
E-core Turbo Ratio Limit Ratio1	33	Enter: Select
E-core Turbo Ratio Limit Ratio2	27	+/-: Change Opt.
E-core Turbo Ratio Limit Ratio3	27	F1: General Help
E-core Turbo Ratio Limit Ratio4	27	F2: Previous Values
E-core Turbo Ratio Limit Ratio5	27	F3: Optimized Defaults
E-core Turbo Ratio Limit Ratio6	27	F4: Save & Exit
E-core Turbo Ratio Limit Ratio7	27	ESC: Exit
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Feature	Option	Description
E-core Turbo Ratio Limit Numcore0/1/2/3/4/5/6/7	Value input	Efficient-core Turbo Ratio Limit Numcore0/1/2/3/4/5/6/7 defines the core range, the turbo ratio is defined in E-core Turbo Ratio Limit Ratio0/1/2/3/4/5/6/7. If value is zero, this entry is ignored.
E-core Turbo Ratio Limit Ratio0/1/2/3/4/5/6/7	Value input	Efficient-core Turbo Ratio Limit Ratio0/1/2/3/4/5/6/7 defines the turbo ratio (max is 85 irrespective of the core extension mode), the core range is defined in E-core Turbo Ratio Limit Numcore0/1/2/3/4/5/6/7.

Figure 60: BIOS Advanced Menu – Power & Performance – CPU – Power Management Control – CPU VR Settings

Aptio Setup – AMI		
Advanced		
CPU VR Settings		
Current VccIn Aux Icc Max	108	
PSYS Slope	0	
PSYS Offset	0	
PSYS Prefix	[+]	
PSYS Pmax Power	0	
Min Voltage Override	[Disabled]	
Min Voltage Runtime*	0	
Min Voltage C8*	0	
VccIN Aux Icc Max	0	
VccIN Aux IMON Slope	111	
VccIN Aux IMON Offset	0	
VccIN Aux IMON Prefix	[+]	
Vsys/Psys Critical	[Disabled]	
Vsys/Psys Full Scale**	200000	
Vsys/Psys Critical Threshould**	130000	
Assertion Deglitch Mantissa	1	→ ←: Select Screen
Assertion Deglitch Exponent	0	↑ ↓: Select Item
De assertion Deglitch Mantissa	13	Enter: Select
De assertion Deglitch Exponent	2	+/-: Change Opt.
VR Power Delivery Design	[AUTO]	F1: General Help
> Acoustic Noise Settings		F2: Previous Values
> Core/IA VR Settings		F3: Optimized Defaults
> GT VR Settings		F4: Save & Exit
> RFI Settings		ESC: Exit
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*These items apper only when enabling Power Min Voltage Override.
** These items appear only when enabling Vsys/Psys Critical.

Feature	Option	Description
PSYS Slope	Value input	PSYS Slope defined in 1/100 increments. Range is 0-200. For a 1.25 slope, enter 125. 0 = AUTO. Uses BIOS VR mailbox command 0x9.
PSYS Offset	Value input	PSYS Offset defined in 1/1000 increments. Range is 0-63999. For an offset of 25.348, enter 25348. PSYS Uses BIOS VR mailbox command 0x4.
PSYS Prefix	[+], [-]	Set the offset value as positive or negative.

Feature	Option	Description
PSYS Pmax Power	Value input	PSYS Pmax power, defined in 1/8 Watt or Percent increments. For Watts, Range is 0-8191 (ex. For 125W, enter 1000). For ATX12VO (ex. For 200%, enter 1600). Uses BIOS VR mailbox command 0xB.
Min Voltage Override	[Disabled], [Enabled]	Min Voltage Override. Enable to override minimum voltage for runtime and for C8.
Min Voltage Runtime / C8	Value input	Min Voltage for Runtime / Package C8. Range is 0 – 1999mV in 1/128 volt increments. Input is in mVolts.
VccIn Aux Icc Max	Value input	Sets the Max Icc VccIn Aux value defined in 1/4A increments. Range is 0 – 512. For an IccMax 32A, enter 128 (32*4).
VccIn Aux IMON Slope	Value input	VccIN Aux IMON Slope defined in 1/100 increments. Range is 0 - 200. For a 1.25 slope, enter 125. 0 = AUTO. Uses BIOS VR mailbox command 0x18.
VccIN Aux IMON Offset	Value input	VccIN Aux IMON Offset defined in 1/1000 increments. Range is 0 - 63999. For an offset of 25.348, enter 25348. IMON Uses BIOS VR mailbox command 0x18.
VccIN Aux IMON Prefix	[+], [-]	Set the offset value as positive or negative.
Vsys/Psys Critical	[Disabled], [Psys Critical], [Vsys Critical]	Vsys/Psys Critical Enable or disable
Vsys/Psys Full Scale / Critical Threshold	Value input	Input Vsys/Psys Full Scale & Critical Threshold. Vsys/Psys Critical = (Critical Threshold / Full Scale). Vsys input is in mVolts. Psys input is in mW or in m% (for ATX12V0)
Assertion Deglitch Mantissa	Value input	Assertion Deglitch Mantissa 0x4F [7-3]. Assertion Deglitch = 2µs * Mantissa * 2^(Exponent)
Assertion Deglitch Exponent	Value input	Assertion Deglitch Exponent 0x4F [3-0]. Assertion Deglitch = 2µs * Mantissa * 2^(Exponent)
De assertion Deglitch Mantissa	Value input	De Assertion Deglitch Mantissa 0x49 [7-3]. Assertion Deglitch = 2µs * Mantissa * 2^(Exponent)
De assertion Deglitch Exponent	Value input	De Assertion Deglitch Exponent 0x49 [3-0]. Assertion Deglitch = 2µs * Mantissa * 2^(Exponent)
VR Power Delivery Design	[AUTO], [ADL P 282 15W], [ADL P 482 28W], [ADL P 682 28W], [ADL P 682 45W], [ADL P 142 15W], [ADL P 242 15W], [ADL P 482 45W], [ADL P 442 45W], [ADL P 442 28W], [ADL P 282 28W], [ADL P 242 28W],	Specifies the ADL Desktop board design used for the VR settings override values. By default, BIOS will override the default Desktop VR settings based on the board design. A value of AUTO (0) will use the board ID to determine the board design. Any other value will override the board ID logic to provide a custom VR Power Delivery Design value. This is intended primarily for validation.

Feature	Option	Description
	[ADL P 142 28W], [ADL P 242 45W], [ADL P 182 28W], [ADL P 662 28W], [ADL P 642 28W], [ADL P 642 45W]	

Figure 61: BIOS Advanced Menu – Power & Performance – CPU – Power Management Control – CPU VR Settings – Acoustic Noise Settings

Aptio Setup – AMI		
Advanced		
Acoustic Noise Settings		
Acoustic Noise Mitigation	[Disabled]	
Pre Wake Time*	0	
Ramp Up Time*	0	
Ramp Down Time*	0	→←: Select Screen
		↑ ↓: Select Item
IA VR Domain		Enter: Select
Disable Fast PKG C State Ramp for IA Domain*	[FALSE]	+/-: Change Opt.
Slow Slew Rate for IA Domain*	[Fast/2]	F1: General Help
		F2: Previous Values
GT VR Domain		F3: Optimized Defaults
Disable Fast PKG C State Ramp for GT Domain*	[FALSE]	F4: Save & Exit
Slow Slew Rate for GT Domain*	[Fast/2]	ESC: Exit
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*These items are activated only when enabling Acoustic Noise Mitigation.

Feature	Option	Description
Acoustic Noise Mitigation	[Disabled], [Enabled]	Enabling this option will help mitigate acoustic noise on certain SKUs when the CPU is in deeper C state.
Pre Wake / Ramp Up / Ramp Down Time	Value input	Set the maximum Pre Wake / Ramp Up / Ramp Down randomization time in micro ticks. Range is 0 – 255. This is for acoustic noise mitigation Dynamic Perodicity Alteration (DPA) tuning.
Disable Fast PKG C State Ramp for IA Domain	[FALSE], [TRUE]	This option needs to be configured to reduce acoustic noise during deeper C states. [False]: Don't disable Fast ramp during deeper C states; [True]: Disable Fast ramp during deeper C state.
Slow Slew Rate for IA Domain	[Fast/2], [Fast/4], [Fast/8], [Fast/16]	Set VR IA Slow Slew Rate for Deep Package C State ramp time; Slow slew rate equals to Fast divided by number, the number is 2, 4, 8, 16 to slow down the slew rate to help minimize acoustic noise.
Disable Fast PKG C State Ramp for GT Domain	[FALSE], [TRUE]	This option needs to be configured to reduce acoustic noise during deeper C states. [False]: Don't disable Fast ramp during deeper C states; [True]: Disable Fast ramp during deeper C state.
Slow Slew Rate for GT Domain	[Fast/2], [Fast/4], [Fast/8]	Set VR GT Slow Slew Rate for Deep Package C State ramp time; Slow slew rate equals to Fast divided by number, the number is

Feature	Option	Description
		2, 4, 8 to slow down the slew rate to help minimize acoustic noise; divide by 16 is disabled.

Figure 62: BIOS Advanced Menu – Power & Performance – CPU – Power Management Control – CPU VR Settings – Core/IA VR Settings

Aptio Setup – AMI		
Advanced		
Core/IA VR Domain		
VR Config Enable	[Enabled]	
Current AC Loadline*	500	
Current DC Loadline*	500	
Current Psi1 Threshold*	16	
Current Psi2 Threshold*	8	
Current Psi3 Threshold*	4	
Current Imon Slope*	0	
Current Imon Offset*	1	
Current VR Current Limit*	128	
Current Tdc Current Limit*	208	
Current Voltage Limit*	1600	
AC Loadline*	0	
DC Loadline*	0	
PS Current Threshold1*	18	
PS Current Threshold2*	8	
PS Current Threshold3*	4	
PS3 Enable*	[Enabled]	
PS4 Enable*	[Enabled]	
IMON Slope*	0	
IMON Offset*	0	→ ←: Select Screen
IMON Prefix*	[+]	↑ ↓: Select Item
VR Current Limit*	0	Enter: Select
VR Voltage Limit*	0	+/-: Change Opt.
TDC Enable*	[Enabled]	F1: General Help
TDC Current Limit*	0	F2: Previous Values
TDC Time Window*	[1 sec]	F3: Optimized Defaults
TDC Lock*	[Disabled]	F4: Save & Exit
IRMS*	[Disabled]	ESC: Exit
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*These items appear only when enabling VR Config Enable.

Feature	Option	Description
VR Config Enable	[Disabled], [Enabled]	VR Config Enable
AC / DC Loadline	Value input	AC / DC Loadline defined I 1/100 mOhms. A value of 100 = 1.00 mOhm, and 1255 = 12.55 mOhm. Range is 0 – 6249 (0 – 62.49 mOhm). 0 = AUTO/HW default. Uses BIOS mailbox command 0x2.
PS Current Threshold1/2/3	Value input	PS Current Threshold1/2/3, defined in 1/4 A increments. A value of 400 = 100 A. Range 0 – 512, which translates to 0 – 128 A. 0 = AUTO. Uses BIOS VR mailbox command 0x3.
PS3 / PS4 Enable	[Disabled], [Enabled]	PS3 / PS4 Enable / Disable. 0 – Disabled 1 – Enabled Uses BIOS VR mailbox command 0x3.
IMON Slope	Value input	IMON Slope defined in 1/100 increments. Range is 0 – 200. For a 1.25 slope, enter 125. 0 = AUTO. Uses BIOS VR mailbox command 0x4.
IMON Offset	Value input	IMON Offset defined in 1/1000 increments. Range is 0 – 63999. For an offset of 25.348, enter 25348. IMON Uses BIOS VR mailbox command 0x4.
IMON Prefix	[+], [-]	Sets the offset value as positive or negative.
VR Current Limit	Value input	Voltage Regulator Current Limit (IccMax). This value represents the Maximum instantaneous current allowed at any given time. The value is represented in 1/4 A increments. 0 means AUTO. Uses BIOS VR mailbox command 0x6.
VR Voltage Limit	Value input	Voltage Limit (VMAX). This value represents the Maximum instantaneous voltage allowed at any given time. Range is 0 – 7999 mV. Uses BIOS VR mailbox command 0x8.
TDC Enable	[Disabled], [Enabled]	TDC Enable. 0 – Disable 1 - Enable
TDC Current Limit	Value input	TDC Current Limit, defined in 1/8 A increments. Range 0 – 32767. For a TDC Current Limit of 125 A, enter 1000. 0 = 0 Amps. Uses BIOS VR mailbox command 0x1A.

Feature	Option	Description
TDC Time Window	[1 sec], [2 sec], [3 sec], [4 sec], [5 sec], [6 sec], [7 sec], [8 sec], [10 sec], [12 sec], [14 sec], [16 sec], [20 sec], [24 sec], [28 sec], [32 sec], [40 sec], [48 sec], [56 sec], [64 sec], [80 sec], [96 sec], [112 sec], [128 sec], [160 sec], [192 sec], [224 sec], [256 sec], [320 sec], [384 sec], [448 sec]	VR TDC Time Window, value in seconds. 1s is default. Range from 1s to 448s.
TDC Lock	[Disabled], [Enabled]	TDC Lock
IRMS	[Disabled], [Enabled]	Enable / Disable IRMS – Current root mean square

Figure 63: BIOS Advanced Menu – Power & Performance – CPU – Power Management Control – CPU VR Settings – GT VR Settings

Aptio Setup – AMI		
Advanced		
GT Domain		
VR Config Enable	[Enabled]	
Current AC Loadline*	650	
Current DC Loadline*	650	
Current Psi1 Threshold*	80	
Current Psi2 Threshold*	20	
Current Psi3 Threshold*	4	
Current Imon Slope*	103	
Current Imon Offset*	1	
Current VR Current Limit*	116	
Current Tdc Current Limit*	160	
Current Voltage Limit*	1519	
AC Loadline*	0	
DC Loadline*	0	
PS Current Threshold1*	80	
PS Current Threshold2*	20	
PS Current Threshold3*	4	
PS3 Enable*	[Enabled]	
PS4 Enable*	[Enabled]	
IMON Slope*	103	→←: Select Screen
IMON Offset*	0	↑ ↓: Select Item
IMON Prefix*	[+]	Enter: Select
VR Current Limit*	0	+/-: Change Opt.
VR Voltage Limit*	0	F1: General Help
TDC Enable*	[Enabled]	F2: Previous Values
TDC Current Limit*#	0	F3: Optimized Defaults
TDC Time Window*#	[1 sec]	F4: Save & Exit
TDC Lock*#	[Disabled]	ESC: Exit
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*These items appear only when enabling VR Config Enable.
These items appear only when enabling TDC Enable.

Feature	Option	Description
VR Config Enable	[Disabled], [Enabled]	VR Config Enable
AC / DC Loadline	Value input	AC / DC Loadline defined I 1/100 mOhms. A value of 100 = 1.00 mOhm, and 1255 = 12.55 mOhm. Range is 0 – 6249 (0 – 62.49 mOhm).

Feature	Option	Description
		0 = AUTO/HW default. Uses BIOS mailbox command 0x2.
PS Current Threshold1/2/3	Value input	PS Current Threshold1/2/3, defined in 1/4 A increments. A value of 400 = 100 A. Range 0 – 512, which translates to 0 – 128 A. 0 = AUTO. Uses BIOS VR mailbox command 0x3.
PS3 / PS4 Enable	[Disabled], [Enabled]	PS3 / PS4 Enable / Disable. 0 – Disabled 1 – Enabled Uses BIOS VR mailbox command 0x3.
IMON Slope	Value input	IMON Slope defined in 1/100 increments. Range is 0 – 200. For a 1.25 slope, enter 125. 0 = AUTO. Uses BIOS VR mailbox command 0x4.
IMON Offset	Value input	IMON Offset defined in 1/1000 increments. Range is 0 – 63999. For an offset of 25.348, enter 25348. IMON Uses BIOS VR mailbox command 0x4.
IMON Prefix	[+], [-]	Sets the offset value as positive or negative.
VR Current Limit	Value input	Voltage Regulator Current Limit (IccMax). This value represents the Maximum instantaneous current allowed at any given time. The value is represented in 1/4 A increments. 0 means AUTO. Uses BIOS VR mailbox command 0x6.
VR Voltage Limit	Value input	Voltage Limit (VMAX). This value represents the Maximum instantaneous voltage allowed at any given time. Range is 0 – 7999 mV. Uses BIOS VR mailbox command 0x8.
TDC Enable	[Disabled], [Enabled]	TDC Enable. 0 – Disable 1 - Enable
TDC Current Limit	Value input	TDC Current Limit, defined in 1/8 A increments. Range 0 – 32767. For a TDC Current Limit of 125 A, enter 1000. 0 = 0 Amps. Uses BIOS VR mailbox command 0x1A.
TDC Time Window	[1 sec], [2 sec], [3 sec], [4 sec], [5 sec], [6 sec], [7 sec], [8 sec], [10 sec], [12 sec], [14 sec], [16 sec], [20 sec], [24	VR TDC Time Window, value in seconds. 1s is default. Range from 1s to 448s.

Feature	Option	Description
	sec], [28 sec], [32 sec], [40 sec], [48 sec], [56 sec], [64 sec], [80 sec], [96 sec], [112 sec], [128 sec], [160 sec], [192 sec], [224 sec], [256 sec], [320 sec], [384 sec], [448 sec]	
TDC Lock	[Disabled], [Enabled]	TDC Lock

Figure 64: BIOS Advanced Menu – Power & Performance – CPU – Power Management Control – CPU VR Settings – RFI Settings

Aptio Setup – AMI		
Advanced		
RFI Domain		
RFI Current Frequency	139.200MHz	→←: Select Screen
RFI Frequency	0	↑ ↓: Select Item
FIVR Spread Spectrum	[Enabled]	Enter: Select
RFI Spread Spectrum*	[1.5%]	+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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*This item appears only when enbling FIVR Spread Spectrum.

Feature	Option	Description
RFI Frequency	Value input	Set desired RFI frequency, in increments of 100 KHz. (For a frequency of 100.6 MHz, enter 1006.)
FIVR Spread Spectrum	[Disabled], [Enabled]	Enable or Disable the FIVR Spread Spectrum
RFI Spread Spectrum	[0.5%], [1%], [1.5%], [2%], [3%], [4%], [5%], [6%]	Set the Spread Spectrum

Figure 65: BIOS Advanced Menu – Power & Performance – CPU – Power Management Control – Custom P-state Table

Aptio Setup – AMI		
Advanced		
Custom P-state Table		
Number of P states	0	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Feature	Option	Description
Number of P states	Value input	Sets the number of custom P-states. At least 2 states must be present.

Figure 66: BIOS Advanced Menu – Power & Performance – CPU – Power Management Control – Power Limit 3 Settings

Aptio Setup – AMI		
Advanced		
Power Limit 3 Override	[Disabled]	
Power Limit 3*	0	
Power Limit 3 Time Window*	[0]	→←: Select Screen
Power Limit 3 Duty Cycle*	0	↑ ↓: Select Item
Power Limit 3 Lock*	[Disabled]	Enter: Select
		+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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*These items appear only when enbling Power Limit 3 Override.

Feature	Option	Description
Power Limit 3 Override	[Disabled], [Enabled]	Enable / Disable Power Limit 3 override. If this option is disabled, BIOS will leave the hardware default values for Power Limit 3 and Power Limit 3 Time Window.
Power Limit 3	Value input	Power Limit 3 in Milli Watts/Percent. BIOS will round to the nearest 1/8W when programming. For example, if 12.50W, enter 12500; if 12%, enter 12000; if 50%, enter 50000. XE SKU: Any value can be programmed. Overclocking SKU: Value must be between Max and Min Power Limits (specified by PACKAGE_POWER_SKU_MSR). Other SKUs: This value must be between Min Power Limit and Processor Base Power (TDP) Limit. If the value is 0, BIOS leaves the hardware default value.
Power Limit 3 Time Window	[0], [3], [4], [5], [6], [7], [8], [10], [12], [14], [16], [20], [24], [28], [32], [40], [48], [56], [64]	Power Limit 3 Time Window value in Milli seconds. The value may vary from 3 to 64 (max). Indicates the time window over which Power Limit 3 value should be maintained. If the value is 0, BIOS leaves the hardware default value.
Power Limit 3 Duty Cycle	Value input	Specify the duty cycle in percentage that the CPU is required to maintain over the configured time window. Range is 0 – 100.
Power Limit 3 Lock	[Disabled], [Enabled]	Power Limit 3 MSR 615h Lock. When enabled PL3 configurations are locked during OS. When disabled PL3 configuration can be changed during OS.

Figure 67: BIOS Advanced Menu – Power & Performance – CPU – Power Management Control – CPU Lock Configuration

Aptio Setup – AMI		
Advanced		
CFG Lock	[Enabled]	
Overclocking Lock	[Enabled]	
		→ ←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Feature	Option	Description
CFG Lock	[Disabled], [Enabled]	Configure MSR 0xE2[15], CGF Lock bit
Overclocking Lock	[Disabled], [Enabled]	Enable / Disable Overclocking Lock (BIT 20) in FLEX_RATIO(194) MSR

Figure 68: BIOS Advanced Menu – Power & Performance – GT – Power Management Control

Aptio Setup – AMI		
Advanced		
GT – Power Management Control		
RC6(Render Standby)	[Enabled]	→ ←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
Maximum GT frequency	[Default Max Frequency]	
Disable Turbo GT frequency	[Disabled]	
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Feature	Option	Description
RC6(Render Standby)	[Disabled], [Enabled]	Check to enable render standby support.
Maximum GT frequency	[Default Max Frequency],	Maximum GT frequency limited by the user. Choose between 200 MHz (RPN) and 1000 MHz (RP0).

Feature	Option	Description
	[100Mhz], [150Mhz], [200Mhz], [250Mhz], [300Mhz], [350Mhz], [400Mhz], [450Mhz], [500Mhz], [550Mhz], [600Mhz], [650Mhz], [700Mhz], [750Mhz], [800Mhz], [850Mhz], [900Mhz], [950Mhz], [1000Mhz], [1050Mhz], [1100Mhz], [1150Mhz], [1200Mhz]	Value beyond the range will be clipped to min / max supported by SKU.
Disable Turbo GT frequency	[Disabled], [Enabled]	[Enabled]: Disable Turbo GT frequency. [Disabled]: GT frequency is not limited.

Figure 69: BIOS Advanced Menu - Display Configuration

Aptio Setup – AMI		
Advanced		
Display Configuration		
Primary Display	[IGFX]	→←: Select Screen
Internal	[Enabled]	↑ ↓: Select Item
Aperture Size	[256MB]	Enter: Select
DVMT Pre-Allocated	[32M]	+/-: Change Opt.
		F1: General Help
Primary IGFX Boot Display	[VBIOS Default]	F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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Feature	Option	Description
Primary Display	[Auto], [IGFX], [PEG Slot], [PCH PCI], [HG]	Select which of IGFX / PEG / PCI Graphics device should be Primary Display or select HG for Hybrid Gfx.
Internal Graphics	[Enabled]	Read only item
Aperture Size	[128MB], [256MB], [512MB], [1024MB]	Select the Aperture Size. Note: Above 4GB MMIO BIOS assignment is automatically enabled when selecting > 2048MB aperture. To use this feature, please disable CSM Support.
DVMT Pre-Allocated	[0M], [32M], [64M], [96M], [128M], [160M], [4M], [8M], [12M], [16M], [20M], [24M], [28M], [32M/F7], [36M], [40M], [44M], [48M], [52M], [56M], [60M]	Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.
Primary IGFX Boot Display	[VBIOS Default], [EFP], [LFP], [EFP3], [EFP2], [EFP4]	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.

Figure 70: BIOS Advanced Menu – PCH-FW Configuration

Aptio Setup – AMI		
Advanced		
ME Firmware Version	16.50.12.1453	
ME Firmware Mode	Normal Mode	
ME Firmware SKU	Consumer SKU	
ME Firmware Status 1	0x90000255	
ME Firmware Status 2	0x80100106	
ME Firmware Status 3	0x00000020	
ME Firmware Status 4	0x00004000	
ME Firmware Status 5	0x00000000	
ME Firmware Status 6	0x40400002	
ME State	[Enabled]	
ME Unconfig on RTC Clear*	[Enabled]	
Comms Hub Support*	[Disabled]	
JHI Support*	[Disabled]	
Core Bios Done Message*	[Enabled]	→←: Select Screen
		↑ ↓: Select Item
> Firmware Update Configuration*		Enter: Select
> PTT Configuration*		+/-: Change Opt.
> FIPS Configuration*		F1: General Help
> ME Debug Configuration*		F2: Previous Values
> Anti-Rollback SVN Configuration*		F3: Optimized Defaults
> OEM Key Revocation Configuration*		F4: Save & Exit
Extend CSME Measurement to TPM-PCR	[Disabled]	ESC: Exit
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* These items appear only when enabling ME State.

Feature	Option	Description
ME State	[Disabled], [Enabled]	When Disabled ME will be put into ME Temporarily Disabled Mode.
ME Unconfig on RTC Clear	[Disabled], [Enabled]	When Disabled ME will not be unconfigured on RTC Clear.
Comms Hub Support	[Disabled], [Enabled]	Enables / Disables support for Comms Hub.
JHI Support	[Disabled], [Enabled]	Enable / Disable Intel® DAL Host Interface Service (JHI).
Core Bios Done Message	[Disabled], [Enabled]	Enable / Disable Core Bios Done message sent to ME.

Feature	Option	Description
Extend CSME Measurement to TPM-PCR	[Disabled], [Enabled]	Enable / Disable Extend CSME Measurement to TPM-PCR[0] and AMT Config to TPM-PCR[1].

Figure 71: BIOS Advanced Menu – PCH-FW Configuration – Firmware Update Configuration

Aptio Setup – AMI		
Advanced		
ME FW Image Re-Flash	[Disabled]	
FW Update	[Enabled]	
		→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Feature	Option	Description
ME FW Re-Flash	[Disabled], [Enabled]	Enable / Disable ME FW Image Re-Flash function.
FW Update	[Disabled], [Enabled]	Enable / Disable ME FW Update function.

Figure 72: BIOS Advanced Menu – PCH-FW Configuration – PTT Configuration

Aptio Setup – AMI		
Advanced		
PTT Capability / State	1 / 0	
TPM Device Selection	[dTPM]	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Feature	Option	Description
TPM Device Selection	[dTPM], [PTT]	Selects TPM device: PTT or dTPM. [PTT]: Enables PTT in SkuMgr [dTPM]: Disables PTT in SkuMgr Warning! PTT /dTPM will be disabled and all data saved on it will be lost.

Figure 73: BIOS Advanced Menu – PCH-FW Configuration – FIPS Configuration

Aptio Setup – AMI		
Advanced		
FIPS Mode Select	[Disabled]	
		→ ←: Select Screen
Current FIPS mode	Disabled	↑ ↓: Select Item
Crypto driver FIPS version	16.50.12.1453	Enter: Select
		+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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Feature	Option	Description
FIPS Mode Select	[Disabled], [Enabled]	FIPS Mode configuration

Figure 74: BIOS Advanced Menu – PCH-FW Configuration – ME Debug Configuration

Aptio Setup – AMI		
Advanced		
HECI Timeouts	[Enabled]	
Force ME DID Init Status	[Disabled]	→ ←: Select Screen
CPU Replaced Polling Disable	[Disabled]	↑ ↓: Select Item
HECI Message check Disable	[Disabled]	Enter: Select
MBP HOB Skip	[Disabled]	+/-: Change Opt.
HECI2 Interface Communication	[Disabled]	F1: General Help
KT Device	[Enabled]	F2: Previous Values
End Of Post Message	[Send in DXE]	F3: Optimized Defaults
D0I3 Setting for HECI Disable	[Disabled]	F4: Save & Exit
MCTP Broadcast Cycle	[Disabled]	ESC: Exit
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Feature	Option	Description
HECI Timeouts	[Disabled], [Enabled]	Enable / Disable HECI Send / Receive Timeouts.
Force ME DID Init Status	[Disabled], [0 – Success], [1 – No Memory in Channels], [2 – Memory Init Error]	Force the DID Initialization Status value.
CPU Replaced Polling Disable	[Disabled], [Enabled]	Setting this option disables CPU replacement polling loop
HECI Message check Disable	[Disabled], [Enabled]	Setting this option disables message check for Bios Boot Path when sending
MBP HOB Skip	[Disabled], [Enabled]	Setting this option will skip MBP HOB
HECI2 Interface Communication	[Disabled], [Enabled]	Adds and Removes HECI2 Device from PCI space.
KT Device	[Disabled], [Enabled]	Enable / Disable KT Device
End Of Post Message	[Disabled], [Send in DXE]	Enable / Disable End of Post message sent to ME
D0I3 Setting for HECI Disable	[Disabled], [Enabled]	Setting this option disables setting D0I3 bit for all HECI devices
MCTP Broadcast Cycle	[Disabled], [Enabled]	Enable / Disable Management Component Transport Protocol Broadcast Cycle and Set PMT as Bus Owner

Figure 75: BIOS Advanced Menu – PCH-FW Configuration – Anti-Rollback SVN Configuration

Aptio Setup – AMI		
Advanced		
Minimal Allowed Anti-Rollback SVN	0	
Executing Anti-Rollback SVN	1	
Automatic HW-Enforced Anti-Rollback SVN	[Disabled]	→←: Select Screen
Set HW-Enforced Anti-Rollback for Current SVN*	[Disabled]	↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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* This item appears only when disabling Automatic HW-Enforced Anti-Rollback SVN.

Feature	Option	Description
Automatic HW-Enforced Anti-Rollback SVN	[Disabled], [Enabled]	When enabled, hardware-enforced Anti-Rollback mechanism is automatically activated: once ME FW was successfully run on a platform, FW with lower ARB-SVN will be blocked from execution.
Set HW-Enforced Anti-Rollback for Current SVN	[Disabled], [Enabled]	Enable hardware-enforced Anti-Rollback mechanism for current ARB-SVN value. FW with lower ARB-SVN will be blocked from execution. The value will be restored to disable after the command is sent.

Figure 76: BIOS Advanced Menu – PCH-FW Configuration – OEM Key Revocation Configuration

Aptio Setup – AMI		
Advanced		
Automatic OEM Key Revocation	[Disabled]	
Invoke OEM Key Revocation*	[Disabled]	
		→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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* This item appears only when disabling Automatic OEM Key Revocation.

Feature	Option	Description
Automatic OEM Key Revocation	[Disabled], [Enabled]	When enabled, BIOS will automatically send HECI command to revoke OEM keys.
Invoke OEM Key Revocation	[Disabled], [Enabled]	A HECI command will be send to revoke OEM key.

Figure 77: BIOS Advanced Menu – Thermal Configuration

Aptio Setup – AMI		
Advanced		
Thermal Configuration		
Enable All Thermal Functions	[Enabled]	→ ←: Select Screen
> CPU Thermal Configuration		↑ ↓: Select Item
> Platform Thermal Configuration		Enter: Select
> Intel® Dynamic Tuning Technology Configuration		+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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Feature	Option	Description
Enable All Thermal Functions	[Disabled], [Enabled]	"Enable All Thermal Functions" is Enabled it Enables 'Memory Thermal Management', 'Active Trip Points', 'Critical Trip Points'. Set to disabled for Manual Configuration.

Figure 78: BIOS Advanced Menu – Thermal Configuration – CPU Thermal Configuration

Aptio Setup – AMI		
Advanced		
CPU Thermal Configuration		
Current Tcc Activation Offset	0	
Tcc Activation Offset	0	
Tcc Offset Time Window	[Disabled]	→ ←: Select Screen
Tcc Offset Clamp Enable	[Disabled]	↑ ↓: Select Item
Tcc Offset Lock Enable	[Enabled]	Enter: Select
Bi-directional PROCHOT#	[Enabled]	+/-: Change Opt.
Disable PROCHOT# Output	[Enabled]	F1: General Help
Disable VR Thermal Alert	[Disabled]	F2: Previous Values
PROCHOT Response	[Enabled]	F3: Optimized Defaults
PROCHOT Lock	[Enabled]	F4: Save & Exit
ACPI T-States	[Disabled]	ESC: Exit
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Feature	Option	Description
Tcc Activation Offset	Value input	

Feature	Option	Description
Tcc Offset Time Window	[Disabled], [5 ms], [10 ms], [55 ms], [156 ms], [375 ms], [500 ms], [750 ms], [1 sec], [2 sec], [3 sec], [4 sec], [5 sec], [6 sec], [7 sec], [8 sec], [10 sec], [12 sec], [14 sec], [16 sec], [20 sec], [24 sec], [28 sec], [32 sec], [40 sec], [48 sec], [56 sec], [64 sec], [80 sec], [96 sec], [112 sec], [128 sec], [160 sec], [192 sec], [224 sec], [256 sec], [320 sec], [384 sec], [448 sec]	Tcc Offset Time Window for Running Average Temperature Limit (RATL) feature. The Tcc offset time window can range from 5 ms to 448 s.
Tcc Offset Clamp Enable	[Disabled], [Enabled]	Tcc Offset Clamp bit Enable for Running Average Temperature Limit (RATL) feature to allow CPU to throttle below P1.
Tcc Offset Lock Enable	[Disabled], [Enabled]	Lock Enable for Running Average Temperature Limit (RATL) feature to lock Temperature Target MSR.
Bi-directional PROCHOT#	[Disabled], [Enabled]	When a processor thermal sensor trips (either core), the PROCHOT# will be driven. If bi-direction is enabled, external agents can drive PROCHOT# to throttle the processor.
Disable PROCHOT# Output	[Disabled], [Enabled]	Enable / Disable PROCHOT# Output
Disable VR Thermal Alert	[Disabled], [Enabled]	Enable / Disable VR Thermal Alert
PROCHOT Response	[Disabled], [Enabled]	Enable / Disable PROCHOT Response
PROCHOT Lock	[Disabled], [Enabled]	Enable / Disable PROCHOT Lock
ACPI T-States	[Disabled], [Enabled]	Enable / Disable ACPI T-States.

Figure 79: BIOS Advanced Menu – Thermal Configuration – Platform Thermal Configuration

Aptio Setup – AMI		
Advanced		
Platform Thermal Configuration		
Critical Trip Point	[119 C (POR)]	
Active Trip Point 0	[71 C]	
Active Trip Point 0 Fan Speed	100	
Active Trip Point 1	[55 C]	
Active Trip Point 1 Fan Speed	75	
Passive Trip Point	[95 C]	
Passive TC1 Value	1	
Passive TC2 Value	5	
Passive TSP Value	10	
Active Trip Points	[Enabled]	
Passive Trip Points	[Disabled]	
Critical Trip Points	[Enabled]	
PCH Temp Read	[Enabled]	
CPU Energy Read	[Enabled]	→ ←: Select Screen
CPU Temp Read	[Enabled]	↑ ↓: Select Item
Alert Enable Lock	[Disabled]	Enter: Select
PCH Alert*	[Disabled]	+/-: Change Opt.
DIMM Alert*	[Disabled]	F1: General Help
CPU Temp	72	F2: Previous Values
CPU Fan Speed	65	F3: Optimized Defaults
		F4: Save & Exit
Boot DTS Read	[Disabled]	ESC: Exit
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* These items appear only when enabling Alert Enable Lock.

Feature	Option	Description
Critical Trip Point	[15 C], [23 C], [31 C], [39 C], [47 C], [55 C], [63 C], [71 C], [79 C], [87 C], [95 C], [100 C], [103 C], [111 C], [119 C (POR)], [127 C], [130 C]	This value controls the temperature of the ACPI Critical Trip Point – the point in which the OS will shut the system off. NOTE: 119 C is the Plan Of Record (POR) for all Intel mobile processors.
Active Trip Point 0 / 1	[Disabled], [15 C], [23 C], [31 C], [39 C], [47 C], [55 C], [63 C], [71 C], [79 C], [87 C], [95	This value controls the temperature of the ACPI Active Trip Point 0 / 1 – the point in which the OS will turn the processor fan on Active Trip Point 0 / 1 Fan Speed.

Feature	Option	Description
	C], [103 C], [111 C], [119 C (POR)]	
Active Trip Point 0 Fan Speed	Value input	Active Trip Point 0 Fan Speed in percentage. Value must be between 0 (Fan off) – 100 (Max fan speed). This is the speed at which fan will run when Active Trip Point 0 is crossed.
Active Trip Point 1 Fan Speed	Value input	Active Trip Point 1 Fan Speed in percentage. Value must be between 0 (Fan off) – 100 (Max fan speed). This value must be less than Active Trip Point 0 Fan Speed. This is the speed at which fan will run when Active Trip 1 is crossed.
Passive Trip Point	[Disabled], [15 C], [23 C], [31 C], [39 C], [47 C], [55 C], [63 C], [71 C], [79 C], [87 C], [95 C], [103 C], [111 C], [119 C (POR)]	This value controls the temperature of the ACPI Passive Trip Point – the point in which the OS will begin throttling the processor.
Passive TC1/2 Value	Value input	This value sets the TC1/2 value for the ACPI Passive Cooling Formula. Range 1 - 16
Passive TSP Value	Value input	This item sets the TSP value for the ACPI Passive Cooling Formula. It represents in tenths of a second how often the OS will read the temperature when passive cooling is enabled. Range 2 - 32
Active Trip Points	[Disabled], [Enabled]	Disable Active Trip Points
Passive Trip Points	[Disabled], [Enabled]	Disable passive Trip Points
Critical Trip Points	[Disabled], [Enabled]	Disable Critical Trip Points
PCH Temp Read	[Disabled], [Enabled]	PCH Temperature Read Enable
CPU Energy Read	[Disabled], [Enabled]	CPU Energy Read Enable
CPU Temp Read	[Disabled], [Enabled]	CPU Temperature Read Enable
Alert Enable Lock	[Disabled], [Enabled]	Lock all Alert Enable settings
PCH Alert	[Disabled], [Enabled]	PCH Alert pin enable
DIMM Alert	[Disabled], [Enabled]	DIMM Alert pin enable
CPU Temp	Value input	Fail Safe temp that EC will use if OS is hung
CPU Fan Speed	Value input	Fan speed that EC will use if OS is hung
Boot DTS Read	[Disabled], [Enabled]	Read PCH, CPU DTS Temperature and publish via SMBIOS table

Figure 80: BIOS Advanced Menu – Thermal Configuration – Intel® Dynamic Tuning Technology Configuration

Aptio Setup – AMI		
Advanced		
Intel® Dynamic Tuning Technology Configuration		
Intel® Dynamic Tuning Technology	[Enabled]	
INT3400 Device*	[Enabled]	
Processor Thermal Device*	[SA Thermal Device]	
PPCC Step Size*(1)	[0.5 Watts]	
Intel® Dynamic Tuning Technology Configuration*	0	
FAN1 Device*	[Enabled]	
FAN2 Device*	[Disabled]	
FAN3 Device*	[Disabled]	
Charger participant*	[Disabled]	
Power participant*	[Disabled]	
Battery Participant*	[Disabled]	
Intel® Dynamic Tuning Technology Battery Sampling Period*(2)	0	→←: Select Screen
PCH FIVR Participant*	[Disabled]	↑ ↓: Select Item
		Enter: Select
Sensor Device 1*	[Disabled]	+/-: Change Opt.
Sensor Device2*	[Disabled]	F1: General Help
Sensor Device 3*	[Disabled]	F2: Previous Values
Sensor Device 4*	[Disabled]	F3: Optimized Defaults
Sensor Device 5*	[Disabled]	F4: Save & Exit
> OEM variable and Object*		ESC: Exit
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* These items appear only when enabling Intel® Dynamic Tuning Technology.
(1) This item appears only when selecting [SA Thermal Device] for Processor Thermal Device.
(2) This item appears only when enabling Battery Participant.

Feature	Option	Description
Intel® Dynamic Tuning Technology	[Disabled], [Enabled]	Enable / Disable Intel Dynamic Platform Thermal Framework
INT3400 Device	[Disabled], [Enabled]	Enable / Disable the INT3400 Device.
Processor Thermal Device	[Disabled], [SA Thermal Device]	Enable / Disable Processor Thermal Device.
PPCC Step Size	[0.5 Watts], [1.0 Watts], [1.5 Watts], [2.0 Watts]	Step size for Turbo power limit (RAPL) control

Feature	Option	Description
Intel® Dynamic Tuning Technology Configuration	Value input	An Integer containing the Intel® Dynamic Tuning Technology Configuration bitmaps: BIT0[Generic UI Access Control] (0 = enable, 1 = disable) BIT1[Restricted UI Access Control] (0 = enable, 1 = disable) BIT2[shell Access Control] (0 = enable, 1 = disable) BIT3[Environment Monitoring Report Control] (0 = report, 1 = silent) BIT4[Thermal Mitigation Report Control] (0 = silent, 1 = report) BIT5[Thermal Policy Report Control] (0 = silent, 1 = report)
FAN1 Device	[Enabled]	Read only item
FAN2/3 Device	[Disabled]	Read only item
Charger participant	[Disabled], [Enabled]	Enable / Disable Charger device
Power participant	[Disabled], [Enabled]	Enable / Disable the Power participant.
Battery Participant	[Disabled], [Enabled]	Enable / Disable the Battery Participant.
Intel® Dynamic Tuning Technology Battery Sampling Period	Value input	This battery sampling period for the Battery Participant Object.
PCH FIVR Participant	[Disabled], [Enabled]	Enable / Disable PCH FIVR Participant
Sensor Device 1 / 2 / 3 / 4 / 5	[Disabled]	Read only item

Figure 81: BIOS Advanced Menu – Thermal Configuration – Intel® Dynamic Tuning Technology Configuration – OEM variable and Object

Aptio Setup – AMI		
Advanced		
OEM variable and Object		
Design Variable 0	0	
Design Variable 1	0	
Design Variable 2	0	
Design Variable 3	0	
Design Variable 4	0	
Design Variable 5	0	
PPCC Object	[Enabled]	
ARTG Object	[Enabled]	→←: Select Screen
PMAX Object	[Enabled]	↑ ↓: Select Item
PMAX Device	[Disabled]	Enter: Select

Aptio Setup – AMI		
Advanced		
PMAX Audio codec*	[Enabled]	+/-: Change Opt.
PMAX WF Camera*	[Enabled]	F1: General Help
PMAX UF Camera*	[Enabled]	F2: Previous Values
PMAX Flash device*	[Enabled]	F3: Optimized Defaults
Processor Thermal Device		F4: Save & Exit
_TMP 1 Object	[Disabled]	ESC: Exit
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* These items appear only when enabling PMAX Device.

Feature	Option	Description
Design Variable 0 / 1 / 2 / 3 / 4 / 5	Value input	OEM Design Variable: an integer between 0 – 255. This allows OEM's to customize Intel® Dynamic Tuning Technology behavior based on platform changes.
PPCC Object	[Disabled], [Enabled]	Enable / Disable PPCC object for validation.
ARTG Object	[Disabled], [Enabled]	Enable / Disable ARTG object for validation.
PMAX Object	[Disabled], [Enabled]	Enable / Disable PMAX object for validation.
PMAX Device	[Enabled], [Disabled]	Enable / Disable PMAX device for validation.
PMAX Audio codec	[Disabled], [Enabled]	Enable / Disable PMAX Audio codec for validation.
PMAX WF Camera	[Disabled], [Enabled]	Enable / Disable PMAX WF Camera for validation.
PMAX UF Camera	[Disabled], [Enabled]	Enable / Disable PMAX UF Camera for validation.
PMAX Flash device	[Disabled], [Enabled]	Enable / Disable PMAX Flash device for validation.
_TMP 1 Object	[Disabled], [Enabled]	Enable / Disable _TMP 1 object for validation.

Figure 82: BIOS Advanced Menu – Platform Settings

Aptio Setup – AMI		
Advanced		
Platform Settings		
Charging Method	[Normal Charging]	
Pseudo G3	[Disabled]	
Firmware Configuration	[Test]	
Scan Matrix Keyboard Support	[Enabled]	
EC PECI Mode	[Legacy PECI mode]	
Power Loss Notification Feature	[Default]	
Device password support	[Enabled]	
Pmic Vcc IO Level	[Disabled]	
Pmic Vddq Level	[Disabled]	
HEBC value	144371	
Pmic SlpS0 VM Support	[Disabled]	
Power Sharing Manager	[Disabled]	
Domain Type SPLC 1*	9	
Default Power Limit 1 SPLC*	4000	
Default Time Window 1 SPLC*	30000	
Domain Type DPLC 1*	9	
Domain Preference DPLC 1*	9	
Power Limit Index 1 DPLC*	0	
Default Power Limit 1 DPLC*	1200	
Default Time Window 1 DPLC*	30000	
Minimum Power Limit 1 DPLC*	1200	
Maximum Power Limit 1 DPLC*	1200	
Maximum Time Window 1 DPLC*	1000	→←: Select Screen
Enable FFU Support	[Disabled]	↑ ↓: Select Item
HID Event Filter Driver	[Enabled]	Enter: Select
System Time and Alarm Source	[ACPI Time and Alarm Device]	+/-: Change Opt.
Enable PowerMeter	[Disabled]	F1: General Help
MPDT Support	[Disabled]	F2: Previous Values
Closed Lid WoV LED Lighting Support	[Disabled]	F3: Optimized Defaults
> VTIO		F4: Save & Exit
> TCSS Platform Setting		ESC: Exit
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* These items appear only when enabling Power Sharing Manager.

Feature	Option	Description
Charging Method	[Normal Charging], [Fast Charging]	Select charging method as Normal Charging or Fast Charging.
Pseudo G3	[Enabled], [Disabled]	Enable / Disable Pseudo G3
Firmware Configuration	[Ignore Policy Update], [Production], [Test]	Firmware Configuration options. NOTE: Ignore Policy Update (STR_FW_CONFIG_DEFAULT_VALUE) is to skip policy update and will ONLY WORK ON A PLATFORM.
Scan Matrix Keyboard Support	[Enabled], [Disabled]	Enable Scan Matrix Keyboard Support
EC PECI Mode	[Legacy PECI mode], [PECI over eSPI mode]	Switch eSPI PECI Mode or Legacy PECI mode
Power Loss Notification Feature	[Disabled], [Enabled], [Default]	Enable / Disable Power Loss Notification Feature
Device password support	[Disabled], [Enabled]	Support device password feature
Pmic Vcc IO Level	[Disabled], [1.05V], [1.071V], [1.023V], [0.997V], [0.850V], [0.900V], [0.950V]	Select the Pmic Vcc IO Voltage Level
Pmic Vddq Level	[Disabled], [0], [1], [2], [3], [4], [5], [6], [7]	Select the Pmic Vddq Voltage Level
HEBC value	Value input	HEBC value 32bit
Pmic SlpS0 VM Support	[Disabled], [Enabled]	Support to auto check Primium PMIC and disable SlpS0 voltage.
Power Sharing Manager	[Disabled], [Enabled]	Configure the PSM ACPI objects.
Domain Type SPLC 1	Code input	09h: Module (M.2); 07h: WiFi / WLAN; 0Fh: WWAN; 10h: WiGig;

Feature	Option	Description
		14h: RFEM
Default Power Limit 1 SPLC	Value input	Power Limit in milli watts
Default Time Window 1 SPLC	Value input	Time Window in milli seconds
Domain Type DPLC 1	Code input	09h: Module (M.2); 07h: WiFi / WLAN; 0Fh: WWAN; 10h: WiGig; 14h: RFEM
Domain Preference DPLC 1	Code input	09h: Module (M.2); 07h: WiFi / WLAN; 0Fh: WWAN; 10h: WiGig; 14h: RFEM
Power Limit Index 1 DPLC	Value input	Index of the specific power limit range information
Default Power Limit 1 DPLC	Value input	Power Limit in milli watts
Default Time Window 1 DPLC	Value input	Time Window in milli seconds
Minimum Power Limit 1 DPLC	Value input	Power Limit in milli watts
Maximum Power Limit 1 DPLC	Value input	Power Limit in milli watts
Maximum Time Window 1 DPLC	Value input	Time Window in milli seconds
Enable FFU Support	[Disabled], [Enabled]	Enable / Disable FFU Support.
HID Event Filter Driver	[Disabled], [Enabled]	Enables / Disables HID Event Filter Driver interface to OS.
System Time and Alarm Source	[ACPI Time and Alarm Device], [Legacy RTC]	Select source of system time and alarm functions. ACPI Time and Alarm (default, legacy RTC disabled) or Legacy RTC support only
Enable PowerMeter	[Disabled], [Enabled]	Enables / Disables PowerMeter
MPDT Support	[Disabled], [Sensor_BOM1], [Sensor_BOM2], [Sensor_BOM1 with Companion Chip]	Enable (Sensor_BOM1, Sensor_BOM2 and Sensor_BOM1 with Companion Chip) / Disable MPDT Support in BIOS
Closed Lid WoV LED Lighting Support	[Enabled], [Disabled]	Disables / Enables Closed Lid WoV LED Lighting Support.

Figure 83: BIOS Advanced Menu – Platform Settings - VTIO

Aptio Setup – AMI		
Advanced		
VTIO		
Enable VTIO Support	[Disabled]	
Expose ISP SDEV Entry*	[Disabled]	
Number of Sensor Entries*(1)	2	
Flags*(1)	0	
Sensor Entry 1*(1)	1	
Sensor Entry 2*(1)	85	
Expose HECI SDEV Entry	[Disabled]	
Number of Sensor Entries*(2)	0	
Expose SPI1 Dev 1E Fun 2 SDEV Entry*	[Disabled]	
Number of Sensor Entries*(3)	1	
Flags*(3)	0	
Sensor Entry 1*(3)	1	
Expose SPI2 Dev 1E Fun 3 SDEV Entry*	[Disabled]	
Number of Sensor Entries*(4)	1	
Flags*(4)	0	
Sensor Entry 1*(4)	1	
Expose XHCI SDEV Entry*	[Disabled]	
Number of USB Devices*(5)	2	
Flags*(5)	0	
USB Device 1*(5)		
Attributes*(5)	0	
Root Port Number*(5)	0	
VID*(5)	0	
PID*(5)	0	
Revision*(5)	0	
Interface Number*(5)	0	
Class*(5)	E	
Subclass*(5)	1	
Protocol*(5)	1	
ACPI Path String Offset*(5)	34	

Aptio Setup – AMI		
Advanced		
ACPI Path String Length*(5)	1E	
Firmware Hash [255:192]* (5)	0	
Firmware Hash [191:128]* (5)	0	
Firmware Hash [127:64]* (5)	0	
Firmware Hash [63:0]* (5)	0	
ACPI Path Name*(5)	_SB.PC00.XHCI.RHUB.HS00.CRGB	
USB Device 2*(5)		
Attributes*(5)	0	
Root Port Number*(5)	1	
VID*(5)	0	
PID*(5)	0	
Revision*(5)	0	
Interface Number*(5)	0	
Class*(5)	E	
Subclass*(5)	1	→←: Select Screen
Protocol*(5)	1	↑ ↓: Select Item
ACPI Path String Offset*(5)	34	Enter: Select
ACPI Path String Length*(5)	1D	+/-: Change Opt.
Firmware Hash [255:192]* (5)	0	F1: General Help
Firmware Hash [191:128]* (5)	0	F2: Previous Values
Firmware Hash [127:64]* (5)	0	F3: Optimized Defaults
Firmware Hash [63:0]* (5)	0	F4: Save & Exit
ACPI Path Name*(5)	_SB.PC00.XHCI.RHUB.HS01.CIR	ESC: Exit
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* These items appear only when enabling Enable VTIO Support.
(1) Thess items appear only when enabling Expose ISP SDEV Entry.
(2) These item appears only when enabling Expose HECI SDEV Entry.
(3) Thess items appear only when enabling Expose SPI1 Dev 1E Fun 2 SDEV Entry.
(4) Thess items appear only when enabling Expose SPI2 Dev 1E Fun 3 SDEV Entry.
(5) Thess items appear only when enabling Expose XHCI SDEV Entry.

Feature	Option	Description
Enable VTIO Support	[Disabled], [Enabled]	Enable / Disable VTIO Support.
Expose ISP SDEV Entry	[Disabled], [Enabled]	ISP Entry in SDEV table will be exposed based on this option
Expose HECI SDEV Entry	[Disabled], [Enabled]	HECI Entry in SDEV table will be exposed based on this option
Expose SPI1 Dev 1E Fun 2 SDEV Entry	[Disabled], [Enabled]	SPI1 Entry in SDEV table will be exposed based on this option
Expose SPI2 Dev 1E Fun 3 SDEV Entry	[Disabled], [Enabled]	SPI2 Entry in SDEV table will be exposed based on this option

Feature	Option	Description
Expose XHCI SDEV Entry	[Disabled], [Enabled]	XHCI Entry in SDEV table will be exposed based on this option
Number of Sensor Entries	Value input	An array of Sensors Entries
Flags	Value input	Enter HEX value BIT[0] – Allow handoff to non-secure OS
Sensor Entry 1 / 2	Value input	Enter HEX value BIT[8:7] – Camera type BIT[6] – Plu-N-Play supported BIT[5:2] – Port ID BIT[1] – Privacy Enabled Sensor present BIT[0] – Embedded Sensor present
Attributes	Value input	Enter HEX value BIT[7:1] – Reserved BIT[0] – USB Composite Device 0x0 – A single interface USB device 0x1 – A function on a USB composite device
Root Port Number	Value input	Root port number on which the secure device is attached to the root hub.
VID	ID input	Vendor ID
PID	ID input	Product ID
Revision	Revision input	Revision
Interface Number	Value input	Interface number (0-based) of the interface on the device that this entry corresponds to. This field is considered valid only if the Attributes indicates that the device is a composite device.
Class	Number input	Class Number of the secure device
Subclass	Number input	Subclass Number of the secure device
Protocol	Number input	Protocol Number of the secure device
ACPI Path String Offset	Value input	Offset for fully qualified ACPI path name of the secure device from the beginning of this table
ACPI Path String Length	Read only	Read only item
Firmware Hash [255:192] / [191:128] / [127:64] / [63:0]	Value input	Firmware Hash [255:192] / [191:128] / [127:64] / [63:0]
ACPI Path Name	Path name input	ACPI Path Name. The default value is _SB.PC00.XHCI.RHUB.HS00.CGRB / _SB.PC00.XHCI.RHUB.HS01.CIR

Figure 84: BIOS Advanced Menu – Platform Settings – TCSS Platform Setting

Aptio Setup – AMI		
Advanced		
TCSS Platform Setting		
Disable TBT PCIE Tree SME	[Enabled]	
USBC connector manager selection	[Disabled]	
Aux Ori Override	[Disabled]	
Type C retimer TX Compliance Mode	[Enabled]	
Type C Port 0*	[Enabled]	
Type C Port 1*	[Disabled]	
Type C Port 2*	[Disabled]	
Type C Port 3*	[Disabled]	
BIOS-TCSS handshake	[Enabled]	
Timeout for EC USB enumeration message	500	→←: Select Screen
USBC and USBA Wake Capability	[S4]	↑ ↓: Select Item
USBC DataRole Swap Platform Disable Option	[TURE]	Enter: Select
		+/-: Change Opt.
PD Information		F1: General Help
PD0 Version	N/A	F2: Previous Values
PD1 Version	N/A	F3: Optimized Defaults
Type C Port 1 Conv to TypeA	[Disabled]	F4: Save & Exit
Type C Port 2 Conv to TypeA Name*(5)	[Disabled]	ESC: Exit
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* These items appear only when enbling Type C retimer TX Compliance Mode.

Feature	Option	Description
Disable TBT PCIE Tree BME	[Disabled], [Enabled]	Disable TBT PCIE RP and child device Tree BME to Enable VTD Base Security
USBC connector manager selection	[Disabled], [Enable UCSI Device], [Enable UCMC Device]	Select UCSI or UCMC device in ACPI support based on configuration
Aux Ori Override	[Disabled], [Enabled]	Aux Ori Override
Type C retimer TX Compliance Mode	[Disabled], [Enabled]	Default is disable Compliance Mode. Change to enabled for Type C retimer Tx Compliance Mode testing.
Type C Port 0 / 1 / 2 / 3	[Disabled], [Enabled]	Enable / Disable Compliance Mode Type C Port 0 / 1 / 2 / 3
BIOS-TCSS handshake	[Disabled], [Enabled]	Enable / Disable BIOS TCSS handshake messages. [Disabled]: TCSS handshake disabled [Enabled]: TCSS handshake with either EC or PMC is enabled based on the board ID

Feature	Option	Description
Timeout for EC USB enumeration message	Value input	BIOS-EC handshake message USBC_GetUSBConnStatus timeout value in milli seconds
USBC and USBA Wake Capability	[S3], [S4]	USBC and USBA Wake Capability
USBC DataRole Swap Platform Disable Option	[TRUE], [FALSE]	Enable / Disable setting USBC DataRole Swap Platform Disable Option
Type C Port 1 / 2 Conv to TypeA	[Disabled], [Enabled]	Enable / Disable Type C Port 1 / 2 Convert to TypeA

Figure 85: BIOS Advanced Menu – ACPI D3Cold settings

Aptio Setup – AMI		
Advanced		
ACPI D3Cold settings		
ACPI D3Cold Support	[Disabled]	
VR Ramp up delay*	16	
PCIE Slot 5 Device Power-on delay in ms*	100	
Audio Delay*	200	
SensorHub*	68	
TouchPad*	68	
TouchPanel*	68	
P-state Capping*	[Disabled]	
USB Port 1*	[Disabled]	
USB Port 2*	[Disabled]	
ZPODD*	[Disabled]	
WWAN*	[D3/L2]	→←: Select Screen
Sata Port 0*	[Disabled]	↑ ↓: Select Item
Sata Port 1*	[Disabled]	Enter: Select
Sata Port 2*	[Disabled]	+/-: Change Opt.
Sata Port 3*	[Disabled]	F1: General Help
Sata Port 4*	[Disabled]	F2: Previous Values
Sata Port 5*	[Disabled]	F3: Optimized Defaults
Sata Port 6*	[Disabled]	F4: Save & Exit
Sata Port 7*	[Disabled]	ESC: Exit
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* These items appear only when enbling ACPI D3Cold Support.

Feature	Option	Description
ACPI D3Cold Support	[Disabled], [Enabled]	Enable / Disable ACPI D3Cold support to be executed on D3 entry and exit Note: Disable it would affect the Storage D3 setting
VR Ramp up delay	Value input	Delay between subsequent VR ramp ups if they are all Turn ON at the same time
PCIE Slot 5 Device Power-on delay in ms	Value input	Delay between applying core power and Deasserting PERST#
Audio Delay	Value input	Delay after applying power to HD Audio (Realtek) codec device.
SensorHub	Value input	Delay after applying power to SensorHub device.
TouchPad	Value input	Delay after applying power to TouchPad device.
TouchPanel	Value input	Delay in PR _ON after applying power to TouchPanel device.
P-state Capping	[Disabled], [Enabled]	Set _PPC and send ACPI notification

Feature	Option	Description
USB Port 1	[High Speed], [Super Speed], [Disabled]	USB RTD3 support. [Super Speed]: USB 3.0 devices will be exposed as RTD3 capable. [High Speed]: USB 2.0 devices will be exposed as RTD3 capable. [Disabled]: USB RTD3 support disabled. For SawtoothPeak USB Port1 (Below) is Superspeed and Port2 (Top) is HighSpeed. Check respective board configuration to know about USB port position.
USB Port 2	[Disabled], [High Speed], [Super Speed], [Super Speed WWAN]	USB RTD3 support. [Super Speed]: USB 3.0 devices will be exposed as RTD3 capable. [High Speed]: USB 2.0 devices will be exposed as RTD3 capable. [Disabled]: USB RTD3 support disabled. For SawtoothPeak USB Port1 (Below) is Superspeed and Port2 (Top) is HighSpeed. Check respective board configuration to know about USB port position.
ZPODD	[Disabled], [Enabled]	Zero Power ODD option is applicable only for the board with ZPODD support.
WWAN	[D3/L2]	Read only item
Sata Port 0..7	[Disabled], [Enabled]	Setup option to control the SATA port RTD3 functionality

Figure 86: BIOS Advanced Menu – BCLK Configuration

Aptio Setup – AMI		
Advanced		
BCLK Source Config	CPU BCLK	
CPU – BCLK Clock Settings		→←: Select Screen
BCLK Frequency	100.00 MHz	↑ ↓: Select Item
		Enter: Select
		+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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Read only.

Figure 87: BIOS Advanced Menu – Intel® Time Coordinated Computing

Aptio Setup – AMI		
Advanced		
Intel® Time Coordinated Computing (Intel® TCC)		
#AC Split Lock	[Disabled]	
#GP Fault UC Lock	[Disabled]	
> Intel® TCC Authentication Menu		
Intel® TCC Mode	[Disabled]	
Intel TCC Mode Affected Settings		
IO Fabric Low Latency	[Disabled]	
GT CLOS	[Disabled]	
> C states (1)		
> Intel® Speed Shift Technology (1)		
> Intel® SpeedStep™ (1)		
> ACPI D3Cold Support (2)		
> Low Power S0 Idle Capability (3)		→←: Select Screen
> SA GV (4)		↑ ↓: Select Item
> Page Close Idle Timeout (4)		Enter: Select
> Power Down Mode (4)		+/-: Change Opt.
> RC6 (Render Standby) (5)		F1: General Help
> DMI Link ASPM Control (6)		F2: Previous Values
> Legacy IO Low Latency (7)		F3: Optimized Defaults
> CPU PCI Express Configuration		F4: Save & Exit
> PCH PCI Express Configuration		ESC: Exit
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(1) The sub-menu is redirected to CPU – Power Management Control (see Figure 54) when pressing these items.
(2) The sub-menu is redirected to ACPI D3Cold settings (see Figure 82) when pressing this item.
(3) The sub-menu is redirected to RC ACPI Settings (see Figure 46) when pressing this item.
(4) The sub-menu is redirected to Memory Configuration (see Figure 137) when pressing this item.
(5) The sub-menu is redirected to GT – Power Management Control (see Figure 65) when pressing this item.
(6) The sub-menu is redirected to PCI Express Configuration (see Figure 156) when pressing this item.
(7) The sub-menu is redirected to PCH-IO Configuration (see Figure 155) when pressing this item.

Feature	Option	Description
#AC Split Lock	[Enabled], [Disabled]	Enable or Disable Alignment Check Exception (#AC). When enabled, this will assert an #AC when any atomic operation has an operand that crosses two cache lines.
#GP Fault UC Lock	[Enabled], [Disabled]	Enable or Disable GP Fault Exception (GP#). When enabled, this will assert an GP# when encountering a Lock to un-cacheable memory before the bus is locked.
Intel® TCC Mode	[Disabled], [Enabled]	Enable or Disable Intel® TCC Mode. When enabled, this will modify system settings to improve real-time performance. The

Feature	Option	Description
		full list of settings and their current state are displayed below when Intel® TCC mode is enabled.
IO Fabric Low Latency	[Disabled], [Enabled]	Enable or Disable IO Fabric Low Latency. This will turn off some power management in the PCH IO fabrics. This option provides the most aggressive IO Fabric performance settings. S3 state is NOT supported.
GT CLOS	[Disabled], [Enabled]	Enable or Disable Graphics Technology (GT) Class of Service. Enable will reduce Gfx LLC allocation to minimize impact of Gfx workload on LLC.

Figure 88: BIOS Advanced Menu – Intel® Time Coordinated Computing – Intel® TCC Authentication Menu

Aptio Setup – AMI		
Advanced		
Intel® TCC Authentication	[OEM Enrolled Key]	
		→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Feature	Option	Description
Intel® TCC Authentication	[OEM Enrolled Key]	Read only item

Figure 89: BIOS Advanced Menu – Intel® Time Coordinated Computing – CPU PCI Express Configuration

Aptio Setup – AMI	
Advanced	
CPU PCI Express Configuration PCI Express Root Port 1 > ASPM* > L1 Substates* > PTM* > VC* > Multi-VC* > PCI Express Clock Gating* PCI Express Root Port 2 > ASPM* > L1 Substates* > PTM*	
> VC* > PCI Express Clock Gating* PCI Express Root Port 3 > ASPM* > L1 Substates* > PTM* > VC* > PCI Express Clock Gating*	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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* The sub-menu is redirected to PCI Express Root Port 1/2/3 (see Figure 150) when pressing these items.

Figure 90: BIOS Advanced Menu – Intel® Time Coordinated Computing – PCH PCI Express Configuration

Aptio Setup – AMI	
Advanced	
PCH PCI Express Configuration PCI Express Root Port 3 > ASPM > L1 Substates > PTM PCI Express Root Port 4 > ASPM	

Aptio Setup – AMI	
Advanced	
> L1 Substates > PTM PCI Express Root Port 7 > ASPM > L1 Substates > PTM PCI Express Root Port 9 > ASPM > L1 Substates > PTM PCI Express Root Port 10 > ASPM > L1 Substates > PTM	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Figure 91: BIOS Advanced Menu – Intel® Time Coordinated Computing – PCH PCI Express Configuration – ASPM / L1 Substates / PTM

Aptio Setup – AMI		
Advanced		
PCI Express Root Port 3/4/7/9/10	[Enabled]	
Connection Type*	[Slot]	
ASPM*	[Auto]	
L1 Substates*	[L1.1 & L1.2]	
L1 Low*	[Enabled]	
ACS*	[Enabled]	
PTM*	[Enabled]	
DPC*	[Disabled]	
EDPC*	[Enabled]	
URR*	[Disabled]	
FER*	[Disabled]	
NFER*	[Disabled]	
CER*	[Disabled]	
SEFE*	[Disabled]	
SENFE*	[Disabled]	
SECE*	[Disabled]	

Aptio Setup – AMI		
Advanced		
PME SCI*	[Enabled]	
Hot Plug*	[Disabled]	
Advanced Error Reporting*	[Enabled]	
PCIe Speed*	[Auto]	
Transmitter Half Swing*	[Disabled]	
Detect Timeout*	0	
Extra Bus Reserved*	0	
Reserved Memory*	10	
Reserved I/O*	4	
PCH PCIe LTR Configuration*		
LTR*	[Enabled]	
Snoop Latency Override*#	[Auto]	→←: Select Screen
Snoop Latency Value*#(1)	60	↑ ↓: Select Item
Snoop Latency Multiplier*#(1)	[1024 ns]	Enter: Select
Non Snoop Latency Override*#	[Auto]	+/-: Change Opt.
Non Snoop Latency Value*#(2)	60	F1: General Help
Non Snoop Latency Multiplier*#(2)	[1024 ns]	F2: Previous Values
		F3: Optimized Defaults
LTR Lock*	[Disabled]	F4: Save & Exit
Peer Memory Write Enable*	[Disabled]	ESC: Exit
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* These items appear only when enabling PCI Express Root Port 3/4/7/9/10
# These items appear only when enabling LTR.
(1) These items appear only when selecting Manual for Snoop Latency Override.
(2) These items appear only when selecting Manual for Mon Snoop Latency Override.

Feature	Option	Description
PCI Express Root Port 3/4/7/9/10	[Disabled], [Enabled]	Control the PCI Express Root Port.
Connection Type	[Bulit-in], [Slot]	[Built-in]: a built-in device is connected to this rootport. SlotImplemented bit will be clear. [Slot]: this rootport connects to user-accessible slot. SlotImplemented bit will be set.
ASPM	[Disabled], [L1], [Auto]	Set the ASPM Level: Force L0s – Force all links to L0s State AUTO – BIOS auto configure DISABLE – Disables ASPM
L1 Substates	[Disabled], [L1.1], [L1.1 & L1.2]	PCI Express L1 Substates settings.
L1 Low	[Disabled],	PCI Express L1 Low Substates Enable / Disable.

Feature	Option	Description
	[Enabled]	
ACS	[Disabled], [Enabled]	Enable / Disable Access Control Services Extended Capability
PTM	[Disabled], [Enabled]	Enable / Disable Precision Time Measurement
DPC	[Disabled], [Enabled]	Enable / Disable Downstream Port Containment
EDPC	[Disabled], [Enabled]	Enable / Disable Rootport extensions for Downstream Port Containment
URR	[Disabled], [Enabled]	PCI Express Unsupported Request Reporting Enable / Disable.
FER	[Disabled], [Enabled]	PCI Express Device Fatal Error Reporting Enable / Disable.
NFER	[Disabled], [Enabled]	PCI Express Device Non-Fatal Error Reporting Enable / Disable.
CER	[Disabled], [Enabled]	PCI Express Device Correctable Error Reporting Enable / Disable.
SEFE	[Disabled], [Enabled]	Root PCI Express System Error on Fatal Error Enable / Disable.
SENFE	[Disabled], [Enabled]	Root PCI Express System Error on Non-Fatal Error Enable / Disable.
SECE	[Disabled], [Enabled]	Root PCI Express System Error on Correctable Error Enable / Disable.
PME SCI	[Disabled], [Enabled]	PCI Express PME SCI Enable / Disable.
Hot Plug	[Disabled], [Enabled]	PCI Express Hot Plug Enable / Disable.
Advanced Error Reporting	[Disabled], [Enabled]	Advanced Error Reporting Enable / Disable.
PCIe Speed	[Auto], [Gen1], [Gen2], [Gen3]	Configure PCIe Speed
Transmitter Half Swing	[Disabled], [Enabled]	Transmitter Half Swing Enable / Disable.
Detect Timeout	Value input	The number of milliseconds reference code will wait for link to exit Detect state for enabled ports before assuming there is no device and potentially disabling the port.
Extra Bus Reserved	Value input	Extra Bus Reserved (0-7) for bridges behind this Root Bridge.
Reserved Memory	Value input	Reserved Memory for this Root Bridge (1-20) MB
Reserved I/O	Value input	Reserved I/O (4K/8K/12K/16K/20K) Range for this Root Bridge.
LTR	[Disabled], [Enabled]	PCH PCIE Latency Reporting Enable / Disable

Feature	Option	Description
Snoop Latency Override	[Disabled], [Manual], [Auto]	Snoop Latency Override for PCH PCIE. [Disabled]: Disable override. [Manual]: Manually enter override values. [Auto] (default): Maintain default BIOS flow.
Snoop Latency Value	Value input	LTR Snoop Latency value of PCH PCIE
Snoop Latency Multiplier	[1 ns], [32 ns], [1024 ns], [32768 ns], [1048576 ns], [33554432 ns]	LTR Snoop Latency Multiplier of PCH PCIE
Non Snoop Latency Override	[Disabled], [Manual], [Auto]	Non Snoop Latency Override for PCH PCIE. [Disabled]: Disable override. [Manual]: Manually enter override values. [Auto] (default): Maintain default BIOS flow.
Non Snoop Latency Value	Value input	LTR Non Snoop Latency value of PCH PCIE
Non Snoop Latency Multiplier	[1 ns], [32 ns], [1024 ns], [32768 ns], [1048576 ns], [33554432 ns]	LTR Non Snoop Latency Multiplier of PCH PCIE
LTR Lock	[Disabled], [Enabled]	PCIE LTR Configuration Lock
Peer Memory Write Enable	[Disabled], [Enabled]	Peer Memory Write Enable / Disable

Figure 92: BIOS Advanced Menu – Functional Safety Configuration

Aptio Setup – AMI		
Advanced		
Functional Safety Configuration		
Fusa Enable	[Disabled]	
Startup Array BIST options		
Enable Startup Array BIST	[Disabled]	
Startup Scan BIST options		
Enable Startup Scan BIST	[Disabled]	
Periodic Scan BIST options		
Enable Periodic Scan BIST	[Disabled]	
Lock Step options for module 0		
Core Lockstep Configuration	[Disable lockstep]	
Lock Step options for module 1		→ ←: Select Screen
		↑ ↓: Select Item
Core Lockstep Configuration	[Disable lockstep]	Enter: Select
		+/-: Change Opt.
Display Fusa Configuration	[Enabled]	F1: General Help
Graphics Fusa Configuration	[Enabled]	F2: Previous Values
Opio Fusa Configuration	[Enabled]	F3: Optimized Defaults
Psf Fusa Configuration	[Disabled]	F4: Save & Exit
Iop Fusa Configuration	[Enabled]	ESC: Exit
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Feature	Option	Description
Fusa Enable	[Disabled], [Enabled]	Enable / Disable all Functional Safety (FUSA) feature
Enable Startup Array BIST	[Disabled], [Enabled]	Enabling this will execute startup array test during boot
Enable Startup Scan BIST	[Disabled], [Enabled]	Enabling this will execute startup scan test during boot

Feature	Option	Description
Enable Periodic Scan BIST	[Disabled], [Enabled]	Enabling this will execute periodic scan test during boot
Core Lockstep Configuration	[Disable lockstep], [Enable lockstep for Core 0 with Core 1, Core 2 with Core 3], [Enable lockstep for Core 0 with Core 1], [Enable lockstep for Core 2 with Core 3]	Enable / Disable Lockstep for Efficient-core module, which has 4 cores each
Display Fusa Configuration	[Disabled], [Enabled]	Enable / Disable Functional Safety (FUSA) on Display
Graphics Fusa Configuration	[Disabled], [Enabled]	Enable / Disable Functional Safety (FUSA) on Graphics
Opio Fusa Configuration	[Disabled], [Enabled]	Enable / Disable Functional Safety (FUSA) on Opio
Psf Fusa Configuration	[Disabled], [Enabled]	Enable / Disable Functional Safety (FUSA) on Psf
Iop Fusa Configuration	[Disabled], [Enabled]	Enable / Disable Functional Safety (FUSA) on Iop

Figure 93: BIOS Advanced Menu – Debug Settings

Aptio Setup – AMI		
Advanced		
Debug Settings		
Kernel Debug Serial Port	[Legacy UART]	→←: Select Screen
Serial Io Uart Debug Power Gating*	[Disabled]	↑ ↓: Select Item
Kernel Debug Patch	[Disabled]	Enter: Select
Debug Token is present	No	+/-: Change Opt.
Platform Debug Consent	[Disabled]	F1: General Help
> VT-d Debug Settings		F2: Previous Values
> Advanced Debug Settings		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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* This item appears only when selecting SERIALIO UART0 for Kernel Debug Serial Port.

Feature	Option	Description
Kernel Debug Serial Port	[Legacy UART], [SERIALIO UART0]	Select Kernel Debug Port and report in ACPI DBG2 table
Serial Io Uart Debug Power Gating	[Disabled], [Enabled]	For S0iX support with Kernel Debugger Enabled. BIOS needs to change DBG2 Port Sub Type as value of 0x14 (0x0014 Intel LPSS) Note: Requires OS support
Kernel Debug Patch	[Disabled], [Enabled]	Enable / Disable Kernel Debug Patch
Platform Debug Consent	[Disabled], [Enabled (All Probes+TraceHub)], [Enabled (Low Power)], [Manual]	Enabled (All Probes+TraceHub) supports all probes with TraceHub enabled and blocks s0ix. Enabled (Low Power) Tracehub is powergated by default, s0ix is viable. Manual: user needs to configure Advanced Debug Settings manually, aimed at advanced users.

Figure 94: BIOS Advanced Menu – Debug Settings – VT-d Debug Settings

Aptio Setup – AMI		
Advanced		
IGD VTD Enable	[Enabled]	
IPU VTD Enable	[Enabled]	
IOP VTD Enable	[Enabled]	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
Version 2.22.1293 Copyright (C) 2024 AMI		

Feature	Option	Description
IGD VTD Enable	[Enabled], [Disabled]	Enable / Disable IGD VTD
IPU VTD Enable	[Enabled], [Disabled]	Enable / Disable IPU VTD
IOP VTD Enable	[Enabled], [Disabled]	Enable / Disable IOP VTD

Figure 95: BIOS Advanced Menu – Debug Settings – Advanced Debug Settings

Aptio Setup – AMI		
Advanced		
USB3 Type-C UFP2DFP Kernel/Platform Debug Support	[No Change]	
USB DbC Enable Mode	[No Change]	
PCH Trace Hub Enable Mode	[Disabled]	
CPU Trace Hub Enable Mode	[Disabled]	
CPU Run Control	[No Change]	
CPU Run Control Lock (1)	[Enabled]	
USB Overcurrent Override for VISA	[Disabled]	
Processor trace memory allocation	[Disabled]	
Processor trace (2)	[Disabled]	
Processor Trace OutPut Scheme (2)	[Single Range Output]	
SMM Processor Trace (2)	[Disabled]	
JTAG C10 Power Gate	[Enabled]	→←: Select Screen
Three Strike Counter	[Enabled]	↑ ↓: Select Item

Aptio Setup – AMI		
Advanced		
CrashLog Feature	[Enabled]	Enter: Select
CrashLog On All Reset (3)	[Disabled]	+/-: Change Opt.
CrashLog Rearm Enable (3)	[Enabled]	F1: General Help
CrashLog Clear Enable (3)	[Disabled]	F2: Previous Values
CrashLog GPRs (3)	[Disabled]	F3: Optimized Defaults
PMC Debug Message Enable	[Disabled]	F4: Save & Exit
Delayed Authentication Mode	[Disabled]	ESC: Exit
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(1) This item appears only when selecting Disabled or Enabled for CPU Run Control.
(2) These items appear only when enabling Processor trace memory allocation.
(3) These items appear only when enabling CrashLog Feature.

Feature	Option	Description
USB3 Type-C UFP2DFP Kernel/Platform Debug Support	[Disabled], [Enabled], [No Change]	This BIOS option enables kernel and platform debug for USB3 interface over a UFP Type-C receptacle, select 'No Change' will do nothing to UFP2DFP setting.
USB DbC Enable Mode	[Disabled], [USB2], [USB3], [Both], [No Change]	[Disabled]: Clear both USB2/3DBCEN [USB2]: Set USB2DBCEN [USB3]: Set USB3DBCEN [Both]: Set both USB2/3DBCEN [No Change]: Comply with HW value
PCH / CPU Trace Hub Enable Mode	[Disabled]	Read only item
CPU Run Control	[Disabled], [Enabled], [No Change]	Enable / Disable CPU Run Control Support [No Change]: Comply with HW value
CPU Run Control Lock	[Disabled], [Enabled]	Enable / Disable CPU Run Control Lock
USB Overcurrent Override for VISA	[Disabled], [Enabled]	This option overrides USB Over Current enablement state that USB OC will be considered after enabling this option. Enable when VISA pin is muxed with USB OC.
Processor trace memory allocation	[Disabled], [4KB], [8KB], [16KB], [32KB], [64KB], [128KB], [256KB], [512KB], [1MB], [2MB], [4MB], [8MB], [32MB], [64MB], [128MB]	Disable or Select Processor trace memory region size: from 4KB ~ 128MB.
Processor trace	[Disabled], [Enabled]	Enable / Disable processor trace feature from CPU MSR. Enabling this feature will immediately start trace collection.
Processor Trace OutPut Scheme	[Single Range Output], [ToPA Output]	Select Single Range Output scheme or ToPA table Output scheme

Feature	Option	Description
SMM Processor Trace	[Disabled], [Enabled]	Enable / Disable usage of Processor Trace in SMM
JTAG C10 Power Gate	[Disabled], [Enabled]	When Enabled, JTAG is power gated in C10 state. When Disabled, keeps the JTAG power up during C10 and deeper power states for debug purpose.
Three Strike Counter	[Disabled], [Enabled]	Enable / Disable Three Strike Counter
CrashLog Feature	[Disabled], [Enabled]	The feature helps collecting crash data from PMC SSRAM
CrashLog On All Reset	[Disabled], [Enabled]	Option to invoke CrashLog collection on all reset
CrashLog Rearm Enable	[Disabled], [Enabled]	Option to invoke crashlog re-arm
CrashLog Clear Enable	[Disabled], [Enabled]	Option to invoke CrashLog clear
CrashLog GPRs	[Disabled], [Enabled], [Gprs Enabled, Smm Gprs Disabled]	Helps collecting crash data from PMC SSRAM. Enabling this may expose personal or confidential information that may be held in the GPRs at the time of the Crash trigger.
PMC Debug Message Enable	[Disabled], [Enabled]	When Enabled, PMC HW will send debug messages to trace hub; When Disabled, PMC HW will never send debug messages to trace hub. Note: When Enabled, may not enter S0ix.
Delayed Authentication Mode	[Disabled], [Enabled]	Enable / Disable Delayed Authentication Mode

Figure 96: BIOS Advanced Menu – Debug Configuration

Aptio Setup – AMI		
Advanced		
Debug Configuration		
RAM	[Disabled]	
Legacy UART	[Enabled]	
USB3	[Disabled]	
Serial IO UART	[Disabled]	
Trace Hub	[Disabled]	
MRC Serial Debug Messages	[Disabled]	
Serial Debug Messages	[Load, Error, Warnings & Info]	
Serial Debug Message Baud Rate	[115200]	→←: Select Screen
		↑ ↓: Select Item
Serial IO Debug Controller Configuration		Enter: Select
Controller Number*	[Serial IO UART 0]	+/-: Change Opt.
Baud Rate*	[115200]	F1: General Help
Stop Bits*	[1]	F2: Previous Values
Parity Bits*	[None]	F3: Optimized Defaults
Flow Control*	[Disabled]	F4: Save & Exit
Word Length*	[8 BITS]	ESC: Exit
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* Thess items appear only when enabling Serial IO UART.

Feature	Option	Description
RAM	[Disabled], [Enabled]	Debug Messages Interface
Legacy UART	[Disabled], [Enabled]	Debug Messages Interface
USB3	[Disabled], [Enabled]	Debug Messages Interface
Serial IO UART	[Disabled], [Enabled]	Debug Messages Interface
Trace Hub	[Disabled], [Enabled]	Debug Messages Interface
MRC Serial Debug Messages	[Disabled], [Error Only], [Error & Warnings], [Load, Error, Warnings & Info], [Load, Error, Warnings, Info & Event], [Load, Error, Warnings, Info & Verbose]	Enable / Disable MRC Serial Debug Messages

Feature	Option	Description
Serial Debug Messages	[Disabled], [Error Only], [Error & Warnings], [Load, Error, Warnings & Info], [Load, Error, Warnings, Info & Event], [Load, Error, Warnings, Info & Verbose]	Enable / Disable some Platform Serial Debug Messages
Serial Debug Message Baud Rate	[9600], [19200], [57600], [115200]	Baud Rate for Serial Debug Messages
Controller Number	[Serial IO UART 0], [Serial IO UART 1], [Serial IO UART 2]	Pch Integrated UART controller number
Baud Rate	[9600], [19200], [57600], [115200], [460800], [921600], [1500000], [1843200], [3000000], [3686400], [6000000]	Serial IO transmission speed in baud [Bd] per second
Stop Bits	[Default], [1], [1.5], [2]	Number of stop bits. This is used to select the number of stop bits per character that the peripheral transmits and receives.
Parity Bits	[Default], [None], [Even], [Odd]	Enable and disable parity generation and detection in transmitted and received serial character.
Flow Control	[Disabled], [Enabled]	Auto or None. Used to help for flow control using external IO pins with the pairing device.
Word Length	[5 BITS], [6 BITS], [7 BITS], [8 BITS]	Select the number of data bits per character that the peripheral transmits and receives.

Figure 97: BIOS Advanced Menu - Trusted Computing

Aptio Setup – AMI		
Advanced		
TPM 2.0 Device Found		
Firmware Version:	16.13	
Vendor:	IFX	
Security Device Support	[Enabled]	
Active PCR banks*	SHA256	
Available PCR banks*	SHA256, SHA384	
SHA256 PCR Bank*	[Enabled]	
SHA384 PCR Bank*	[Disabled]	→←: Select Screen
		↑ ↓: Select Item
Pending operation*	[None]	Enter: Select
Platform Hierarchy*	[Enabled]	+/-: Change Opt.
Storage Hierarchy*	[Enabled]	F1: General Help
Endorsement Hierarchy*	[Enabled]	F2: Previous Values
Physical Presence Spec Version*	[1.3]	F3: Optimized Defaults
TPM 2.0 Interface Type*	[TIS]	F4: Save & Exit
Device Select*	[Auto]	ESC: Exit
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* These items appear only when enabling Security Device Support.

Feature	Option	Description
Security Device Support	[Disabled], [Enabled]	Enable or Disable 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	[Disabled], [Enabled]	Enable or Disable SHA256 PCR Bank
SHA384 PCR Bank	[Disabled], [Enabled]	Enable or Disable SHA384 PCR Bank
Pending operation	[None], [TPM Clear]	Schedule an Operation for the Security Device. NOTE: Your Computer will reboot during restart in order to change State of Security Device.
Platform Hierarchy	[Disabled], [Enabled]	Enable or Disable Platform Hierarchy
Storage Hierarchy	[Disabled], [Enabled]	Enable or Disable Storage Hierarchy
Endorsement Hierarchy	[Disabled], [Enabled]	Enable or Disable Endorsement Hierarchy
Physical Presence Spec Version	[1.2], [1.3]	Select to Tell O.S. to support PPI Spec Version 1.2 or 1.3. Note some HCK tests might not support 1.3.

Feature	Option	Description
TPM 2.0 Interface Type	[TIS]	Read only item
Device Select	[TPM 1.2], [TPM 2.0], [Auto]	TPM 1.2 will restrict support to TPM 1.2 devices, TPM 2.0 will restrict support to TPM 2.0 devices, Auto will support both with default set to TPM 2.0 devices if not found, TPM 1.2 devices will be enumerated.

Figure 98: BIOS Advanced Menu – ACPI Settings

Aptio Setup – AMI		
Advanced		
ACPI Settings		
Enable ACPI Auto Configuration	[Disabled]	→←: Select Screen ↑ ↓: Select Item
Enable Hibernation*	[Enabled]	Enter: Select
ACPI Sleep State*	[S3 (Suspend to RAM)]	+/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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* These items appear only when disabling Enable ACPI Auto Configuration.

Feature	Option	Description
Enable ACPI Auto Configuration	[Disabled], [Enabled]	Enables or Disables BIOS ACPI Auto Configuration.
Enable Hibernation	[Disabled], [Enabled]	Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may not be effective with some operating systems.
ACPI Sleep State	[Suspend Disabled], [S3 (Suspend to RAM)]	Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed.

Figure 99: BIOS Advanced Menu – Miscellaneous

Aptio Setup – AMI		
Advanced		
Miscellaneous Configuration		
> Preset DIO in BIOS		
> Control KSC firmware		
> Update KSC firmware		
> Generic eSPI Decode Ranges		
> Watchdog		
Reset Button Behavior	[Chipset Reset]	
I2C Speed	[100 KHz]	→←: Select Screen
Onboard I2C Mode	[Multimaster]	↑ ↓: Select Item
Manufacturing mode	[Disabled]	Enter: Select
BIOS Test Mode	[Disabled]	+/-: Change Opt.
Last system reset through	[Power-on reset]	F1: General Help
Create GSPI ACPI dev	[Disabled]	F2: Previous Values
PCIe Wake	[Disabled]	F3: Optimized Defaults
		F4: Save & Exit
Onboard EEPROM Write Protect	[WP Enabled]	ESC: Exit
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Feature	Option	Description
Reset Button Behavior	[Chipset Reset], [Power Cycle]	Select Reset Button Behavior: Chipset Reset & Power Cycle.
I2C Speed	[100 KHz], [400 KHz], [1 MHz]	Select I2C Bus Speed in KHz. For a default system 100 KHz should be an appropriate value.
Onboard I2C Mode	[Multimaster], [Busclear]	MultiMaster / BusClear
Manufacturing mode	[Disabled]	Read only item
BIOS Test Mode	[Disabled]	Read only item
Last system reset through	[Power-on reset]	Read only item
Create GSPI ACPI dev	[Disabled], [Kontron Linux BSP], [Win10 RhProxy style]	If set to 'Kontron Linux BSP' then a generic GSPI device will be used by Kontron Linux BSP. 'Win10 RhProxy style' supports this driver type under Win10.
PCIe Wake	[Disabled], [Enabled]	Set to enable or disable PCIe wake. This would affect features such as Wake 0/1 and Wake from Lan (WOL).
Onboard EEPROM Write Protect	[WP Disabled], [WP Enabled]	Set WP enable or disable the Onboard EEPROM Write Protect

Figure 100: BIOS Advanced Menu – Miscellaneous – Preset DIO in BIOS

Aptio Setup – AMI		
Advanced		
Allows to preset GPIOs during BIOS startup.		
Control DIO in BIOS	[Disabled]	
DIO #0*	[Skip]	
Output level*(1)	[Low]	
DIO #1*	[Skip]	
Output level*(1)	[Low]	
DIO #2*	[Skip]	
Output level*(1)	[Low]	
DIO #3*	[Skip]	
Output level*(1)	[Low]	→←: Select Screen
DIO #4*	[Skip]	↑ ↓: Select Item
Output level*(1)	[Low]	Enter: Select
DIO #5*	[Skip]	+/-: Change Opt.
Output level*(1)	[Low]	F1: General Help
DIO #6*	[Skip]	F2: Previous Values
Output level*(1)	[Low]	F3: Optimized Defaults
DIO #7*	[Skip]	F4: Save & Exit
Output level*(1)	[Low]	ESC: Exit
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* These items appear only when enabling Control DIO in BIOS.
(1) This item appears only when selecting Output for DIO #0/1/2/3/4/5/6/7 respectively.

Feature	Option	Description
Control DIO in BIOS	[Disabled], [Enabled]	Enables or disables DIO GPIO control in BIOS. If set to 'disabled' then the GPIOs are not touched by BIOS.
DIO #0..7	[Input], [Output], [Skip]	Determine the type of the DIO configuration. If this is set to 'Skip' then this GPIO will be left untouched.
Output level	[Low], [High]	Set the level of a DIO pin

Figure 101: BIOS Advanced Menu – Miscellaneous – Control KSC firmware

Aptio Setup – AMI		
Advanced		
Allows to control KSC firmware related settings.		
Lock FW update access	[Enabled]	→←: Select Screen ↑ ↓: Select Item
> KSC OTP area control		Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Feature	Option	Description
Lock FW update access	[Disabled], [Enabled]	Locks access to KSC firmware area during runtime.

Figure 102: BIOS Advanced Menu – Miscellaneous – Control KSC firmware – KSC OTP area control

Aptio Setup – AMI		
Advanced		
Allows to control KSC OTP area related settings.		
KSC OTP access lock	[Enabled]	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Feature	Option	Description
KSC OTP access lock	[Enabled]	Read only item

Figure 103: BIOS Advanced Menu – Miscellaneous – Update KSC firmware

Aptio Setup – AMI		
Advanced		
Allows to update KSC firmware from BIOS.		
Auto update KSC FW	[Disabled]	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Feature	Option	Description
Auto update KSC FW	[Disabled], [Enabled]	Updates KSC firmware to BIOS internal version (best known config) on next system start. To update FW set item to 'Enabled' and exit the setup using 'Save changes and exit'.

Figure 104: BIOS Advanced Menu – Miscellaneous – Generic eSPI Decode Ranges

Aptio Setup – AMI		
Advanced		
Generic eSPI Decode Ranges		
Generic LPC via eSPI Decode 1	[Disabled]	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
Base Address*	100	
Length*	8	
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* These items appear only when enabling Generic LPC via eSPI Decode 1.

Feature	Option	Description
Generic LPC via eSPI Decode 1	[Disabled], [Enabled]	Enable generic LPC via eSPI decode range.
Base Address	Value input	Base address of the generic decode range.

Feature	Option	Description
		Valid between 0100h – FFF0h. Must be 8-byte aligned. Please note that it also has to be length-aligned.
Length	Value input	Length of the generic decode range in hexadecimal notation. Valid between 0008h – 0100h. Must be multiple of 8h.

Figure 105: BIOS Advanced Menu – Miscellaneous – Watchdog

Aptio Setup – AMI		
Advanced		
Watchdog Configuration.		
Auto-reload	[Disabled]	
Global Lock	[Disabled]	
WDT Strobe	[Disabled]	
Stage 1 Mode	[Disabled]	
Assert WDT Signal (1)	[Disabled]	
Stage 1 Timeout (2)	[1m]	→←: Select Screen
		↑ ↓ : Select Item
Stage 2 Mode (3)	[Delay]	Enter: Select
Assert WDT Signal (1)	[Disabled]	+/-: Change Opt.
Stage 2 Timeout (2)	[1m]	F1: General Help
		F2: Previous Values
Stage 3 Mode (3)	[Delay]	F3: Optimized Defaults
Assert WDT Signal (1)	[Disabled]	F4: Save & Exit
Stage 3 Timeout (2)	[1m]	ESC: Exit
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(1) This item appears only when selecting Reset or Delay for Stage 1/2/3 Mode.
(2) This item appears only when selecting Reset, Delay or WDT Signal only for Stage 1/2/3 Mode.
(3) This item appears only when selecting Delay or WDT Signal only for Stange N-1 Mode.

Feature	Option	Description
Auto-reload	[Disabled], [Enabled]	Enable automatic reload of watchdog timers on timeout.
Global Lock	[Disabled], [Enabled]	If set to enabled, all Watchdog registers (except WD_KICK) become read only until the board is reset.
WDT Strobe	[Disabled], [Enabled]	Enable / disable WDT Strobe input.
Stage 1/2/3 Mode	[Disabled], [Reset], [Delay], [WDT Signal only]	Select Action for this Watchdog stage

Feature	Option	Description
Assert WDT Signal	[Disabled], [Enabled]	Enable / disable assertion of WDT signal to baseboard on stage timeout.
Stage 1/2/3 Timeout	[1m], [3m], [10m], [30m]	Select Timeout value for this Watchdog stage

Figure 106: BIOS Advanced Menu – SMART Settings

Aptio Setup – AMI		
Advanced		
SMART Settings		
SMART Self Test	[Disabled]	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Feature	Option	Description
SMART Self Test	[Disabled], [Enabled]	Run SMART Self Test on all HDDs during POST.

Figure 107: BIOS Advanced Menu – H/W Monitor

Aptio Setup – AMI		
Advanced		
KSC based H/W Monitor		
Temperature sensors:		
#1: CPU Temp	: + 38.8 C	
#2: PCH Temp	: + 35.0 C	
#3: SYSTEM Temp	: + 35.0 C	
Voltage sensors:		
#1: V_IN	: 9.1 V	
#2: 12V_S0	: 8.1 V	
#3: 5V_S0	: 5.1 V	
#4: 3V3_S0	: 3.4 V	
#5: 3V_BAT	: 2.9 V	
Fan speed & control:		
#1: CPU Fan	: 4200 RPM	
Fan Control	[Auto]	
Signal Filter Control*#	[Auto]	→ ←: Select Screen
Signal Filter*#(1)	Enabled	↑ ↓: Select Item
Fan Pulse*#	[Auto]	Enter: Select
Fan Pulse*#(2)	: 2	+/-: Change Opt.
Fan Speed Control*#	[Auto]	F1: General Help
Fan Speed Control*#(3)	Normal	F2: Previous Values
Fan Speed#	100	F3: Optimized Defaults
Reference Temperature*	[All Temperatures]	F4: Save & Exit
> Fan #1 Trip Point Table*		ESC: Exit
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* These items appear when selecting Auto for Fan Control.
# These items appear when selecting Manual for Fan Control.
(1) This item appears only when selecting Auto for Signal Filter Control.
(2) This item appears only when selecting Auto for Fan Pulse.
(3) This item appears only when selecting Auto for Fan Speed Control.

Feature	Option	Description
Fan Control	[Disabled], [Manual], [Auto]	Set fan control mode. 'Disabled' will disable the control circuit and stops the fan.
Signal Filter Control	[Disabled], [Enabled], [Auto]	Enable / Disable Fab Tacho Signal Filter. [Auto] = Setting from KSC

Feature	Option	Description
Fan Pulse	[Auto], [1], [2], [3], [4], [5], [6], [7], [8]	Number of pulses the fan produces during one revolution. Range: 1 - 8
Fan Speed Control	[Normal], [Reverse], [Auto]	Set fan speed control method. [Auto] = Setting from KSC [Normal] = Signal has normal behaviour [Reverse] = Signal has reversed behaviour
Fan Speed	Value input	Manual fan speed in %
Reference Temperature	[#1: CPU Temp], [#2: PCH Temp], [#3: SYSTEM Temp], [All Temperatures]	Determines the temperature source which is used for automatic fan control

Figure 108: BIOS Advanced Menu – H/W Monitor – Fan #1 Trip Point Table

Aptio Setup – AMI		
Advanced		
Fan #1 Automode	[Internal table]	
Fan Trip Point 1*	50	
Fan Hysteresis 1*	50	
Fan TP Speed 1*	54	
Fan Trip Point 2*	60	
Fan Hysteresis 2*	55	
Fan TP Speed 2*	58	→←: Select Screen
		↑ ↓: Select Item
Fan Trip Point 3*	70	Enter: Select
Fan Hysteresis 3*	61	+/-: Change Opt.
Fan TP Speed 3*	82	F1: General Help
		F2: Previous Values
Fan Trip Point 4*	80	F3: Optimized Defaults
Fan Hysteresis 4*	71	F4: Save & Exit
Fan TP Speed 4*	100	ESC: Exit
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* These items appear only when selecting User table for Fan #1 Automode.

Feature	Option	Description
Fan #1 Automode	[Internal table], [User table]	Chooses between internal table and user table for automatic fan control.

Figure 109: BIOS Advanced Menu – S5 RTC Wake Settings

Aptio Setup – AMI		
Advanced		
Wake system from S5	[Disabled]	
Wake up hour (1)	0	
Wake up minute (1)	0	→←: Select Screen
Wake up second (1)	0	↑ ↓: Select Item
Wake up minute increase (2)	1	Enter: Select
		+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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(1) These items appear only when selecting Fixed Time for Wake system from S5.
(2) This item appears only when selecting Dynamic Time for Wake system from S5.

Feature	Option	Description
Wake system from S5	[Disabled], [Fixed Time], [Dynamic Time]	Enable or disable System wake on alarm event. Select Fixed Time, system will wake on the hr::min::sec specified. Select Dynamic Time, system will wake on the current time + Increase minute(s).
Wake up hour	Value input	Select 0 – 23 For example, enter 3 for 3 am and 15 for 3 pm.
Wake up minute	Value input	Select 0 – 59 for Minute
Wake up second	Value input	Select 0 – 59 for Second
Wake up minute increase	Value input	1 - 5

Figure 110: BIOS Advanced Menu – UEFI Variables Protection

Aptio Setup – AMI		
Advanced		
Password protection of Runtime Variables	[Enabled]	
		→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Feature	Option	Description
Password protection of Runtime Variables	[Enabled], [Disabled]	Control the NVRAM Runtime Variables protection through System Admin Password

Figure 111: BIOS Advanced Menu – Serial Port Console Redirection

Aptio Setup – AMI		
Advanced		
COM0		
Console Redirection	[Disabled]	
> Console Redirection Settings*		
COM1		
Console Redirection	[Disabled]	
> Console Redirection Settings*		
COM2		
Console Redirection	[Disabled]	
> Console Redirection Settings*		
COM3		
Console Redirection	[Disabled]	
> Console Redirection Settings*		→←: Select Screen
		↑ ↓: Select Item
Legacy Console Redirection		Enter: Select
> Legacy Console Redirection Settings		+/-: Change Opt.
		F1: General Help
Serial Port for Out-of-Band Management / Windows Emergency		F2: Previous Values
Management Services (EMS)		F3: Optimized Defaults
Console Redirection EMS	[Disabled]	F4: Save & Exit
> Console Redirection Settings*		ESC: Exit
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* These items activate only when enabling Console Redirection (EMS).

Feature	Option	Description
Console Redirection (EMS)	[Disabled], [Enabled]	Console Redirection Enable or Disable.

Figure 112: BIOS Advanced Menu – Serial Port Console Redirection – COM0/1/2/3 Console Redirection Settings

Aptio Setup – AMI		
Advanced		
COM0/1/2/3 Console Redirection Settings		
Terminal Type	[ANSI]	
Bits per second	[115200]	→←: Select Screen
Data Bits	[8]	↑ ↓: Select Item
Parity	[None]	Enter: Select
Stop Bits	[1]	+/-: Change Opt.
Flow Control	[None]	F1: General Help
VT-UTF8 Combo Key Support	[Enabled]	F2: Previous Values
Recorder Mode	[Disabled]	F3: Optimized Defaults
Resolution 100x31	[Disabled]	F4: Save & Exit
Putty KeyPad	[VT100]	ESC: Exit
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Feature	Option	Description
Terminal Type	[VT100], [VT100Plus], [VT-UTF8], [ANSI]	Emulation: [ANSI]: Extended ASCII char set. [VT100]: ASCII char set. [VT100Plus]: Extends VT100 to support color, function keys, etc. [VT-UTF8]: Uses UTF8 encoding to map Unicode chars onto 1 or more bytes.
Bits per second	[9600], [19200], [38400], [57600], [115200]	Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds.
Data Bits	[7], [8]	Data Bits
Parity	[None], [Even], [Odd], [Mark], [Space]	A parity bit can be sent with the data bits to detect some transmission errors. [Even]: parity bit is 0 if the num of 1's in the data bits is even. [Odd]: parity bit is 0 if num of 1's in the data bits is odd. [Mark]: parity bit is always 1. [Space]: Parity bit is always 0. Mark and Space Parity do not allow for error detection. They can be used as an additional data bit.
Stop Bits	[1], [2]	Stop bits indicate the end of a serial data packet. (A start bit indicates the beginning). The standard setting is 1 stop bit. Communication with slow devices may require more than 1 stop bit.

Feature	Option	Description
Flow Control	[None], [Hardware RTS/CTS]	Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a 'stop' signal can be sent to stop the data flow. Once the buffers are empty, a 'start' signal can be sent to re-start the flow. Hardware flow control uses two wires to send start / stop signals.
VT-UTF8 Combo Key Support	[Disabled], [Enabled]	Enable VT-UTF8 Combination Key Support for ANSI / VT100 terminals
Recorder Mode	[Disabled], [Enabled]	With this mode enabled only text will be sent. This is to capture Terminal data.
Resolution 100x31	[Disabled], [Enabled]	Enables or disables extended terminal resolution
Putty KeyPad	[VT100], [LINUX], [XTERMR6], [SCO], [ESCN], [VT400]	Select FunctionKey and KeyPad on Putty.

Figure 113: BIOS Advanced Menu – Serial Port Console Redirection – Legacy Console Redirection Settings

Aptio Setup – AMI		
Advanced		
Legacy Console Redirection Settings		
Redirection COM Port	[COM2]	→←: Select Screen
Resolution	[80x24]	↑ ↓: Select Item
Redirect After POST	[Always Enable]	Enter: Select
		+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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Feature	Option	Description
Redirection COM Port	[COM2], [COM3], [COM0], [COM1]	Select a COM port to display redirection of Legacy OS and Legacy OPROM Messages
Resolution	[80x24], [80x25]	On Legacy OS, the number of Rows and Columns supported redirection

Feature	Option	Description
Redirect After POST	[Always Enable], [BootLoader]	When Bootloader is selected, then Lagacy Console Redirection is disabled before booting to legacy OS. When Always Enable is selected, then Legacy Console Redirection is enabled for legacy OS. Default setting for this option is set to Always Enable.

Figure 114: BIOS Advanced Menu – Serial Port Console Redirection – Console Redirection EMS Settings

Aptio Setup – AMI		
Advanced		
Out-of-Band Mgmt Port	[COM2]	
Terminal Type EMS	[VT-UTF8]	
Bits per second EMS	[115200]	→←: Select Screen
Flow Control EMS	[None]	↑ ↓: Select Item
Data Bits EMS	8	Enter: Select
Parity EMS	None	+/-: Change Opt.
Stop Bits EMS	1	F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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Feature	Option	Description
Out-of-Band Mgmt Port	[COM2], [COM3], [COM0], [COM1]	Microsoft Windows Emergency Management Services (EMS) allows for remote management of a Windows Server OS through a serial port.
Terminal Type EMS	[VT100], [VT100Plus], [VT-UTF8], [ANSI]	VT-UTF8 is the preferred terminal type for out-of-band management. The next best choice is VT100+ and then VT100. See above, in Console Redirection Settings page, for more Help with Terminal Type / Emulation.
Bits per second EMS	[9600], [19200], [57600], [115200]	Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds.
Flow Control EMS	[None], [Hardware RTS/CTS], [Software Xon/Xoff]	Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a ‘stop’ signal can be sent to stop the data flow. Once the buffers are empty, a ‘start’ signal can be sent to re-start the flow. Hardware flow control uses two wires to send start / stop signals.

Figure 115: BIOS Advanced Menu – AMI Graphic Output Protocol Policy

Aptio Setup – AMI		
Advanced		
Intel® Graphics Controller		
Intel® GOP Driver [21.0.1063]		
Output Select	[EDP1]	→←: Select Screen
BIST Enable	[Disabled]	↑ ↓: Select Item
		Enter: Select
		+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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Feature	Option	Description
Output Select	[EDP1], [DP1], [EDP1 + DP1 [ACTIVE]]	Output Interface
BIST Enable	[Disabled], [Enabled]	Starts or stops the BIST on the integrated display panel.

Figure 116: BIOS Advanced Menu – SIO Common Setting

Aptio Setup – AMI		
Advanced		
SIO Common Setting		
		→←: Select Screen
Lock Legacy Resources	[Disabled]	↑ ↓: Select Item
		Enter: Select
		+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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Feature	Option	Description
Lock Legacy Resources	[Disabled], [Enabled]	Enables or Disables Lock of Legacy Resources

Figure 117: BIOS Advanced Menu – SIO Configuration

Aptio Setup – AMI	
Advanced	
AMI SIO Driver Version: A5.19.00	
Super IO Chip Logical Devices(s) Configuration > [*Active*] Serial Port 0 > [*Active*] Serial Port 1 > [*Active*] Serial Port 2 > [*Active*] Serial Port 3 WARNING: Logical Devices state on the left side of the control, reflects the current Logical Device state. Changes made during Setup Session will be shown after you restart the system.	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Figure 118: BIOS Advanced Menu – SIO Configuration – [*Active*] Serial Port 0

Aptio Setup – AMI		
Advanced		
Serial Port 0 Configuration		
Use This Device	[Enabled]	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
Logical Device Settings:*		
Current: IO=3F8h; IRQ=4;*		
Possible:*	[Use Automatic Settings]	
WARNING: Disabling SIO Logical Devices may have unwanted side effects. PROCEED WITH CAUTION.		
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* These items appear only when enabling Use This Device.

Feature	Option	Description
Use This Device	[Disabled], [Enabled]	Enables or Disables this Logical Device.
Possible:	[Use Automatic Settings], [IO=3F8h; IRQ=4;], [IO=3F8h; IRQ=4;], [IO=2F8h; IRQ=3;]	Allows the user to change the device resource settings. New settings will be reflected on this setup page after system restarts.

Figure 119: BIOS Advanced Menu – SIO Configuration – [*Active*] Serial Port 1

Aptio Setup – AMI		
Advanced		
Serial Port 1 Configuration		
Use This Device	[Enabled]	→←: Select Screen ↑ ↓: Select Item
Logical Device Settings:* Current: IO=2F8h; IRQ=3;*		Enter: Select +/-: Change Opt. F1: General Help
Possible:*	[Use Automatic Settings]	F2: Previous Values F3: Optimized Defaults
WARNING: Disabling SIO Logical Devices may have unwanted side effects. PROCEED WITH CAUTION.		F4: Save & Exit ESC: Exit
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* These items appear only when enabling Use This Device.

Feature	Option	Description
Use This Device	[Disabled], [Enabled]	Enables or Disables this Logical Device.
Possible:	[Use Automatic Settings], [IO=2F8h; IRQ=3;], [IO=2F8h; IRQ=3;], [IO=3F8h; IRQ=4;]	Allows the user to change the device resource settings. New settings will be reflected on this setup page after system restarts.

Figure 120: BIOS Advanced Menu – SIO Configuration – [*Active*] Serial Port 2

Aptio Setup – AMI		
Advanced		
Serial Port 2 Configuration		
Use This Device	[Enabled]	→←: Select Screen ↑ ↓: Select Item
Logical Device Settings:* Current: IO=220h; IRQ=7;*		Enter: Select +/-: Change Opt. F1: General Help
Possible:*	[Use Automatic Settings]	F2: Previous Values F3: Optimized Defaults
WARNING: Disabling SIO Logical Devices may have unwanted side effects. PROCEED WITH CAUTION.		F4: Save & Exit ESC: Exit
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* These items appear only when enabling Use This Device.

Feature	Option	Description
Use This Device	[Disabled], [Enabled]	Enables or Disables this Logical Device.
Possible:	[Use Automatic Settings], [IO=220h; IRQ=7; DMA;], [IO=220h; IRQ=5,6,7,10,11,12; DMA;]	Allows the user to change the device resource settings. New settings will be reflected on this setup page after system restarts.

Figure 121: BIOS Advanced Menu – SIO Configuration – [*Active*] Serial Port 3

Aptio Setup – AMI		
Advanced		
Serial Port 3 Configuration		
Use This Device	[Enabled]	→←: Select Screen ↑ ↓: Select Item
Logical Device Settings:*		Enter: Select
Current: IO=230h; IRQ=10;*		+/-: Change Opt.
Possible:*	[Use Automatic Settings]	F1: General Help F2: Previous Values
WARNING: Disabling SIO Logical Devices may have unwanted side effects.		F3: Optimized Defaults F4: Save & Exit
PROCEED WITH CAUTION.		ESC: Exit
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* These items appear only when enabling Use This Device.

Feature	Option	Description
Use This Device	[Disabled], [Enabled]	Enables or Disables this Logical Device.
Possible:	[Use Automatic Settings], [IO=230h; IRQ=10; DMA;], [IO=230h; IRQ=5,6,7,10,11,12; DMA;]	Allows the user to change the device resource settings. New settings will be reflected on this setup page after system restarts.

Figure 122: BIOS Advanced Menu – PCI Subsystem Settings

Aptio Setup – AMI		
Advanced		
AMI PCI Driver Version: A5.01.28		
PCI Settings Common for all Devices:		→←: Select Screen
Re-Size BAR Support	[Disabled]	↑ ↓: Select Item
BME DMA Mitigation	[Disabled]	Enter: Select
		+/-: Change Opt.
Change Settings of the Following PCI Devices:		F1: General Help
		F2: Previous Values
WARNING: Changing PCI Device(s) settings may have unwanted side		F3: Optimized Defaults
effects! System may HANG!		F4: Save & Exit
PROCEED WITH CAUTION.		ESC: Exit
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Feature	Option	Description
Re-Size BAR Support	[Disabled], [Enabled]	If system has Resizable BAR capable PCIe Devices, this option Enables or Disables Resizable BAR Support.
BME DMA Mitigation	[Disabled], [Enabled]	Re-enable Bus Master Attribute disabled during Pci enumeration for PCI Bridges after SMM Locked.

Figure 123: BIOS Advanced Menu – USB Configuration

Aptio Setup – AMI		
Advanced		
USB Configuration		
USB Module Version	32	
USB Controllers: 2 XHCIs USB Devices: 1 Keyboard		
Legacy USB Support	[Enabled]	→←: Select Screen
XHCI Hand-off	[Enabled]	↑ ↓: Select Item
USB Mass Storage Driver Support	[Enabled]	Enter: Select
		+/-: Change Opt.
USB hardware delays and time-outs:		F1: General Help
USB transfer time-out	[20 sec]	F2: Previous Values
Device reset time-out	[20 sec]	F3: Optimized Defaults
Device power-up delay	[Auto]	F4: Save & Exit
Device power-up delay in seconds*	5	ESC: Exit
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* This item appears only when selecting Manual for Device power-up delay in seconds.

Feature	Option	Description
Legacy USB Support	[Enabled], [Disabled], [Auto]	Enables Legacy USB support. 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	[Enabled], [Disabled]	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	[Disabled], [Enabled]	Enable / Disable USB Mass Storage Driver Support.
USB transfer time-out	[1 sec], [5 sec], [10 sec], [20 sec]	The time-out value for Control, Bulk, and Interrupt transfers.
Device reset time-out	[10 sec], [20 sec], [30 sec], [40 sec]	USB mass storage device Start Unit command time-out.

Feature	Option	Description
Device power-up delay	[Auto], [Manual]	Maximum time the device will take before it properly reports itself to the Host Controller. 'Auto' uses default value: for a Root port it is 100 ms, for a Hub port the delay is taken from Hub descriptor.
Device power-up delay in seconds	Value input	Delay range is 1..40 seconds, in one second increments

Figure 124: BIOS Advanced Menu – Network Stack Configuration

Aptio Setup – AMI		
Advanced		
Network Stack	[Disabled]	
IPv4 PXE Support*	[Disabled]	
IPv4 HTTP Support*	[Disabled]	→←: Select Screen
IPv6 PXE Support*	[Disabled]	↑ ↓: Select Item
IPv6 HTTP Support*	[Disabled]	Enter: Select
PXE boot wait time*	0	+/-: Change Opt.
Media detect count*	1	F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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* Thess items appear only when enabling Network Stack.

Feature	Option	Description
Network Stack	[Disabled], [Enabled]	Enable / Disable UEFI Network Stack
IPv4 PXE Support	[Disabled], [Enabled]	Enable / Disable IPv4 PXE boot support. If disabled, IPv4 PXE boot support will not be available.
IPv4 HTTP Support	[Disabled], [Enabled]	Enable / Disable IPv4 HTTP boot support. If disabled, IPv4 HTTP boot support will not be available.
IPv6 PXE Support	[Disabled], [Enabled]	Enable / Disable IPv6 PXE boot support. If disabled, IPv6 PXE boot support will not be available.
IPv6 HTTP Support	[Disabled], [Enabled]	Enable / Disable IPv6 HTTP boot support. If disabled, IPv6 HTTP boot support will not be available.
PXE boot wait time	Value input	Wait time in seconds to press ESC key to abort the PXE boot. Use either +/- or numeric keys to set the value.
Media detect count	Value input	Number of times the presence of media will be checked. Use either +/- or numeric keys to set the value.

Figure 125: BIOS Advanced Menu – CSM Configuration

Aptio Setup – AMI		
Advanced		
Compatibility Support Module Configuration		
CSM Support	[Disabled]	
CSM16 Module Version	N/A, reset required	
GateA20 Active*	[Upon Request]	
Option ROM Messages*(1)	[Force BIOS]	
INT19 Trap Response*	[Immediate]	
HDD Connection Order*(2)	[Adjust]	
Boot option filter*	[UEFI only]	→ ←: Select Screen ↑ ↓ : Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
Option ROM execution*		
Network*	[Do not launch]	
Storage*	[UEFI]	
Video*	[UEFI]	
Other PCI devices*	[UEFI]	
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* These items appear only when enabling CSM Support.
(1) This item appears only when selecting Legacy for Video.
(2) This item appears only when selecting UEFI and Legacy or Legacy only for Boot option filter.

Feature	Option	Description
CSM Support	[Disabled], [Enabled]	Enable / Disable CSM Support.
GateA20 Active	[Upon Request], [Always]	[Upon Request]: GA20 can be disabled using BIOS services. [Always]: do not allow disabling GA20. This option is useful when any RT code is executed above 1MB.
Option ROM Messages	[Force BIOS], [Keep Current]	Set display mode for Option ROM
INT19 Trap Response	[Immediate], [Postponed]	BIOS reaction on INT19 trapping by Option ROM: [Immediate]: execute the trap right away; [Postponed]: execute the trap during legacy boot.
HDD Connection Order	[Adjust], [Keep]	Some OS require HDD handles to be adjusted, i.e. OS is installed on drive 80h.
Boot option filter	[UEFI and Legacy], [Legacy only], [UEFI only]	This option controls Legacy / UEFI ROMs priority

Feature	Option	Description
Network	[Do not launch], [UEFI], [Legacy]	Controls the execution of UEFI and Legacy Network OpROM
Storage	[Do not launch], [UEFI], [Legacy]	Controls the execution of UEFI and Legacy Storage OpROM
Video	[Do not launch], [UEFI], [Legacy]	Controls the execution of UEFI and Legacy Video OpROM
Other PCI devices	[Do not launch], [UEFI], [Legacy]	Determines OpROM execution policy for devices other than Network, Storage, or Video

Figure 126: BIOS Advanced Menu – NVMe Configuration

Aptio Setup – AMI	
Advanced	
NVMe Configuration	
No NVME Device Found	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Figure 127: BIOS Advanced Menu – SDIO Configuration

Aptio Setup – AMI		
Advanced		
SDIO Configuration		
SDIO Access Mode	[Auto]	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Feature	Option	Description
SDIO Access Mode	[Auto], [ADMA], [SDMA], [PIO]	[Auto]: Access SD device in DMA mode if controller supports it, otherwise in PIO mode. [DMA]: Access SD device in DMA mode. [PIO]: Access SD device in PIO mode.

Figure 128: BIOS Advanced Menu – CH7513A Configurations

Aptio Setup – AMI		
Advanced		
CH7513A Configurations		
LFP Selection	[LVDS]	→←: Select Screen ↑ ↓: Select Item
LVDS Panel Type (1)	[1920x1080 24Bit 2CH]	Enter: Select +/-: Change Opt.
Backlight Source Selection (1)(2)	[Controlled by PCH]	F1: General Help
Panel Brightness (1)(2)	254	F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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(1) These items appear when selection LVDS for LFP Selection.
(2) These items appear when selecting eDP for LFP Selection.

Feature	Option	Description
LFP Selection	[Disabled], [LVDS], [eDP]	Select the LFP Configuration
LVDS Panel Type	[800x600 18Bit 1CH], [1024x768 18Bit 1CH], [1024x768 24Bit 1CH], [1280x768 18Bit 1CH], [1280x800 18Bit 1CH], [1280x960 18Bit 1CH], [1280x1024 24Bit 2CH], [1366x768 18Bit 1CH], [1366x768 24Bit 1CH], [1440x900 24Bit 2CH], [1400x1050 24Bit 2CH], [1600x900 24Bit 2CH], [1680x1050 24Bit 2CH], [1600x1200 24Bit 2CH], [1920x1080 24Bit 2CH], [1920x1200 24Bit 2CH]	LVDS panel by selecting the appropriate setup item.
Backlight Source Selection	[Controlled by PCH], [Controlled by Switch]	Set the backlight source Selection
Panel brightness	Value input	Set panel brightness

Figure 129: BIOS Advanced Menu – F81435 Configurations

Aptio Setup – AMI		
Advanced		
F81435 Configurations		
COM0 Mode Selection	[RS-232]	
COM0 Slew Rate Control	[RS-232 to 3 Mbps or RS-485/RS-422 to 20 Mbps]	
COM0 Transceiver	[Normal mode]	
COM0 Internal Terminator Switch Control	[Terminator switch is disabled]	
COM0 External Terminator Switch Control	[Terminator switch is disabled]	
COM1 Mode Selection	[RS-232]	
COM1 Slew Rate Control	[RS-232 to 3 Mbps or RS-485/RS-422 to 20 Mbps]	
COM1 Transceiver	[Normal mode]	
COM1 Internal Terminator Switch Control	[Terminator switch is disabled]	
COM1 External Terminator Switch Control	[Terminator switch is disabled]	
COM2 Mode Selection	[RS-232]	
COM2 Slew Rate Control	[RS-232 to 3 Mbps or RS-485/RS-422 to 20 Mbps]	
COM2 Transceiver	[Normal mode]	→←: Select Screen
COM2 Internal Terminator Switch Control	[Terminator switch is disabled]	↑ ↓: Select Item
COM2 External Terminator Switch Control	[Terminator switch is disabled]	Enter: Select
		+/-: Change Opt.
COM3 Mode Selection	[RS-232]	F1: General Help
COM3 Slew Rate Control	[RS-232 to 3 Mbps or RS-485/RS-422 to 20 Mbps]	F2: Previous Values
COM3 Transceiver	[Normal mode]	F3: Optimized Defaults
COM3 Internal Terminator Switch Control	[Terminator switch is disabled]	F4: Save & Exit
COM3 External Terminator Switch Control	[Terminator switch is disabled]	ESC: Exit
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Feature	Option	Description
COM0/1/2/3 Mode Selection	[RS-422 Signal Master], [RS-232], [RS-485 with Auto Flow Control], [RS-422 Multi Master]	Mode selection for COM0/1/2/3
COM0/1/2/3 Slew Rate Control	[Limit driver slew rate to 250Kbps for RS-232 and RS-485/RS-422], [RS-232 to 3 Mbps or RS-485/RS-422 to 20 Mbps]	Slew rate control for COM0/1/2/3
COM0/1/2/3 Transceiver	[Shutdown mode], [Normal mode]	Shutdown the Transceiver of COM0/1/2/3
COM0/1/2/3 Internal Terminator Switch Control	[Terminator switch is disabled], [Terminator switch is enabled]	Internal Terminator switch control for RS-422/RS-485 of COM0/1/2/3
COM0/1/2/3 External Terminator Switch Control	[Terminator switch is disabled], [Terminator switch is enabled]	External Terminator switch control for RS-422/RS-485 of COM0/1/2/3

Figure 130: BIOS Advanced Menu – Tls Auth Configuration

Aptio Setup – AMI	
Advanced	
> Server CA Configuration	
> Client Cert Configuration*	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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* Read only item

Figure 131: BIOS Advanced Menu – Tls Auth Configuration – Server CA Configuration

Aptio Setup – AMI	
Advanced	
> Enroll Cert	
> Delete Cert	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
Version 2.22.1293 Copyright (C) 2024 AMI	

Figure 132: BIOS Advanced Menu – Tls Auth Configuration – Server CA Configuration – Enroll Cert

Aptio Setup – AMI	
Advanced	
> Enroll Cert Using File	
Cert GUID	→←: Select Screen
	↑ ↓: Select Item
> Commit Changes and Exit	Enter: Select
> Discard Changes and Exit	+/-: Change Opt.
	F1: General Help
	F2: Previous Values
	F3: Optimized Defaults
	F4: Save & Exit
	ESC: Exit
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Feature	Option	Description
Cert GUID	ID input	Input digit character in 11111111-2222-3333-4444-1234567890ab format.

Figure 133: BIOS Advanced Menu – RAM Disk Configuration

Aptio Setup – AMI		
Advanced		
Disk Memory Type:	[Boot Service Data]	
> Create raw		→←: Select Screen
> Create from file		↑ ↓: Select Item
		Enter: Select
Created RAM disk list:		+/-: Change Opt.
RAM Disk 0: [0x6BF98018, 0x6BF99017]*	[Disabled]	F1: General Help
		F2: Previous Values
Remove selected RAM disk(s).		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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* This item is available only when creating a RAM disk.

Feature	Option	Description
Disk Memory Type	[Boot Service Data], [Reserved]	Specifies type of memory to use from available memory pool in system to create a disk.
RAM Disk 0	[Disabled], [Enabled]	Select for remove

Figure 134: BIOS Advanced Menu – RAM Disk Configuration – Create raw

Aptio Setup – AMI		
Advanced		
Size (Hex):	1	
Create & Exit		→←: Select Screen
Discard & Exit		↑ ↓: Select Item
		Enter: Select
		+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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Feature	Option	Description
Size (Hex)	Value input	The valid RAM disk size should be multiples of the RAM disk block size.

Figure 135: BIOS Advanced Menu – Intel® Ethernet Controller I226-IT – C0:EA:C3:D1:D1:0E/0F

Aptio Setup – AMI		
Advanced		
UEFI Driver	Intel® 2.5G Ethernet Controller 0.10.06	
Device Name	Intel® Ethernet Controller I226-IT	
Link Status	[Disconnected]	→←: Select Screen ↑ ↓: Select Item Enter: Select
MAC Address	C0:EA:C3:D1:D1:0E/0F	+/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
Version 2.22.1293 Copyright (C) 2024 AMI		

Read only

Figure 136: BIOS Advanced Menu – Driver Health

Aptio Setup – AMI		
Advanced		
> Intel® 2.5G Ethernet Controller 0.10.06	Healthy	
> Intel® 2.5G Ethernet Controller 0.10.06	Healthy	
		→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
Version 2.22.1293 Copyright (C) 2024 AMI		

Figure 137: BIOS Advanced Menu – Driver Health – Intel® 2.5G Ethernet Controller 0.10.06

Aptio Setup – AMI		
Advanced		
Intel® Ethernet Controller I226-IT	Healthy	
Intel® Ethernet Controller I226-IT	Healthy	
		→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
Version 2.22.1293 Copyright (C) 2024 AMI		

Read only

8.2.3. Chipset Setup Menu

The Chipset setup menu provides functions and a sub-screen for chipset configurations. The following sub-screen functions are included in the menu:

- System Agent (SA) Configuration
- PCH-IO Configuration

Figure 138: BIOS Chipset Setup Menu

Aptio Setup – AMI					
Main	**Advanced**	**Chipset**	**Security**	**Boot**	**Save & Exit**
> System Agent (SA) Configuration > PCH-IO Configuration					
				→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit	
Version 2.22.1293 Copyright (C) 2024 AMI					

Figure 139: BIOS Chipset Setup Menu – System Agent (SA) Configuration

Aptio Setup – AMI		
Chipset		
System Agent (SA) Configuration		
VT-d	Supported	
> Memory Configuration		
> Graphics Configuration		
> DMI/OPI Configuration		
> TCSS setup menu		
> Display setup menu		
> PCI Express Configuration		
Stop Grant Configuration	[Auto]	
Number of Stop Grant Cycles*	1	
VT-d	[Enabled]	
Control Iommu Pre-boot Behavior	[Enable IOMMU during boot]	
X2APIC Opt Out	[Disabled]	
DMA Control Guarantee	[Enabled]	
Thermal Device (B0:D4:F0)	[Disabled]	→←: Select Screen
Cpu CrashLog (Device 10)	[Disabled]	↑ ↓: Select Item
GNA Device (B0:D8:F0)	[Enabled]	Enter: Select
CRID Support	[Disabled]	+/-: Change Opt.
WRC Feature	[Disabled]	F1: General Help
Above 4GB MMIO BIOS assignment	[Enabled]	F2: Previous Values
IPU Device (B0:D5:F0)	[Disabled]	F3: Optimized Defaults
IPU 1811 Dash Camera	[Disabled]	F4: Save & Exit
> MIPI Camera Configuration		ESC: Exit
Version 2.22.1293 Copyright (C) 2024 AMI		

* This item appears only when selecting Manual for Stop Grant Configuration.

Feature	Option	Description
Stop Grant Configuration	[Auto], [Manual]	Automatic / Manual stop grant configuration
Number of Stop Grant Cycles	Value input	Selects number of Stop-Grant cycles.
VT-d	[Enabled], [Disabled]	VT-d capability
Control Iommu Pre-boot Behavior	[Disable IOMMU], [Enable IOMMU during boot]	Enable IOMMU in Pre-boot environment (If DMAR table is installed in DXE and if VTD_INFO_PPI is installed in PEI.)

Feature	Option	Description
X2APIC Opt Out	[Enabled], [Disabled]	Enable / Disable X2APIC_OPT_OUT bit
DMA Control Guarantee	[Enabled], [Disabled]	Enable / Disable DMA_CONTROL_GUARANTEE bit
Thermal Device (B0:D4:F0)	[Enabled], [Disabled]	Enable / Disable SA Thermal Device. Always enabled for ICL A0 stepping.
Cpu CrashLog (Device 10)	[Enabled], [Disabled]	Enable / Disable Cpu CrashLog Device.
GNA Device (B0:D8:F0)	[Enabled], [Disabled]	Enable / Disable SA GNA Device.
CRID Support	[Enabled], [Disabled]	Enable / Disable SA CRID and TCSS CRID control for Intel SIPP
WRC Feature	[Enabled], [Disabled]	Enable / Disable SA WRC (Write Cache) Feature of IOP. When enabled, supports IO devices allocating onto the ring and into LLC.
Above 4GB MMIO BIOS assignment	[Enabled], [Disabled]	Enable / Disable above 4GB MemoryMappedIO BIOS assignment. This is enabled automatically when Aperture Size is set to 2048MB.
IPU Device (B0:D5:F0)	[Enabled], [Disabled]	Enable / Disable SA IPU Device.
IPU 1181 Dash Camera	[Enabled], [Disabled]	Enable / Disable SA IPU 1181 Dash Camera support.

Figure 140: BIOS Chipset Setup Menu – System Agent (SA) Configuration – Memory Configuration

Aptio Setup – AMI		
Chipset		
> Memory Thermal Configuration		
> Memory Training Algorithms		
Memory Configuration		
Memory RC Version	0.0.4.74	
Memory Frequency	4800 MHz	
tCL-tRCD-tRP-tRAS	40-39-39-77	
MC 0 Ch 0 DIMM 0	Populated & Enabled	
Size	16384 MB (DDR5)	
Number of Ranks	1	
Manufacturer	Unknown	
MC 0 Ch 0 DIMM 1	Not Populated / Disabled	
MC 1 Ch 0 DIMM 0	Not Populated / Disabled	
MC 1 Ch 0 DIMM 1	Not Populated / Disabled	

Aptio Setup – AMI		
Chipset		
Debug Value	0	
MRC ULT Safe Config	[Disabled]	
LPDDR DqDqs Re-Training	[Enabled]	
Safe Mode Support	[Disabled]	
Memory Test on Warm Boot	[Enabled]	
Maximum Memory Frequency	[Auto]	
LP5 Bank Mode	[Auto]	
Frequency Limit for Mixed 2DPC DDR4	0	
Frequency Limit for Mixed 2DPC DDR5 1 Rank 8GB and 8GB	2000	
Frequency Limit for Mixed 2DPC DDR5 1 Rank 16GB and 16GB	2000	
Frequency Limit for Mixed 2DPC DDR5 1 Rank 8GB and 16GB	2000	
Frequency Limit for Mixed 2DPC DDR5 2 Rank	2000	
LCT Cmd Eye Width	96	
HOB Buffer Size	[Auto]	
Max TOLUD	[Dynamic]	
SA GV	[Enabled]	
Gear Ratio (1)	0	
First Point Frequency (2)	0	
First Point Gear (2)	0	
Second Point Frequency (2)	0	
Second Point Gear (2)	0	
Third Point Frequency (2)	0	
Third Point Gear (2)	0	
Fourth Point Frequency (2)	0	
Fourth Point Gear (2)	0	
SAGV Switch Factor IA	30	
SAGV Switch Factor GT	30	
SAGV Switch Factor IO	30	
SAGV Switch Factor Stall	30	
Threshold For Switch Up	1	
Threshold For Switch Down	1	
Retrain on Fast Fail	[Enabled]	
DDR4_1DPC	[Enabled]	
Row Hammer Mode	[RFM]	
RH LFSR0 Mask (3)	[1/2^11]	
RH LFSR1 Mask (3)	[1/2^11]	
MC Refresh Rate	[NORMAL Refresh]	
Refresh Watermarks	[High]	

Aptio Setup – AMI		
Chipset		
LPDDR ODT RttWr	0	
LPDDR ODT RttCa	0	
Exit On Failure (MRC)	[Enabled]	
New Features 1 - MRC	[Disabled]	
New Features 2 – MRC	[Disabled]	
Ch Hash Override	[Disabled]	
Ch Hash Support (4)	[Enabled]	
Ch Hash Mask (4)	2096	
Ch Hash Interleaved Bit (4)	[BIT8]	
Extended Bank Hashing	[Enabled]	
Per Bank Refresh	[Enabled]	
VC1 Read Metering	[Enabled]	
Strong Weak Leaker	7	
Power Down Mode	[Auto]	
Pwr Down Idle Timer	0	
Page Close Idle Timeout	[Enabled]	
Memory Scrambler	[Enabled]	
Force ColdReset	[Disabled]	
Controller 0, Channel 0 Control	[Enabled]	
Controller 0, Channel 1 Control	[Enabled]	
Controller 0, Channel 2 Control	[Enabled]	
Controller 0, Channel 3 Control	[Enabled]	
Controller 1, Channel 0 Control	[Enabled]	
Controller 1, Channel 1 Control	[Enabled]	
Controller 1, Channel 2 Control	[Enabled]	
Controller 1, Channel 3 Control	[Enabled]	
Force Single Rank	[Disabled]	
Memory Remap	[Enabled]	
Time Measure	[Disabled]	
Fast Boot	[Enabled]	
Rank Margin Tool Per Task	[Disabled]	
Training Tracing	[Disabled]	
Lpddr Mem WL Set	[Set B]	→ ←: Select Screen
BDAT Memory Test Type	[Rank Margin Tool Rank]	↑ ↓: Select Item
Rank Margin Tool Loop Count	0	Enter: Select
ECC DFT	[Disabled]	+/-: Change Opt.
Write0	[Disabled]	F1: General Help
Periodic DCC	[Disabled]	F2: Previous Values
LPMode	[Auto]	F3: Optimized Defaults
PPR Enable	[Disabled]	F4: Save & Exit

Aptio Setup – AMI		
Chipset		
SAM Overloading	[Disabled]	ESC: Exit
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(1) This item appears only when selecting Disabled for SA GV.
(2) These items appear only when selecting Enabled or Fiexd to 1st / 2nd / 3rd / 4th Point for SA GV.
(3) These items appear only when selecting RFM or pTRR for Row Hammer Mode.
(4) These items activate only when enabling Ch Hash Override.

Feature	Option	Description
Debug Value	Value input	Debug Value
MRC ULT Safe Config	[Disabled], [Enabled]	MRC ULT Safe Config for PO
LPDDR DqDqs Re-Training	[Disabled], [Enabled]	Disable / Enable LPDDR DqDqs Re-Training
Safe Mode Support	[Disabled], [Enabled]	Safe Mode enable support. Option will be used for changes/WAs that may affect an stable MRC
Memory Test on Warm Boot	[Disabled], [Enabled]	Enable or Disable Base Memory Test Run on Warm Boot
Maximum Memory Frequency	[Auto], [1067], [1333], [1400], [1600], [1800], [1867], [2000], [2133], [2200], [2400], [2600], [2667], [2800], [2933], [3000], [3200], [3467], [3600], [3733], [4000], [4200], [4267], [4400], [4600], [4800], [5000], [5200], [5400], [5600], [5800], [6000], [6200], [6400], [10000], [12800]	Maximum Memory Frequency Selection in Mhz.
LP5 Bank Mode	[Auto], [LP5 8 Bank Mode], [LP5 16 Bank Mode], [LP5 BG Mode]	LP5 Bank Mode
Frequency Limit for Mixed 2DPC DDR4	Value input	Override the reduced speed in mixed 2DPC config or non-POR 2DPC config. 0 = Auto, otherwise speed in MT/s
Frequency Limit for Mixed 2DPC DDR5 1 Rank 8GB/16GB and 8GB/16GB	Value input	Override the reduced speed in mixed 2DPC config or non-POR 2DPC config. 0 = Auto, otherwise speed in MT/s

Feature	Option	Description
Frequency Limit for Mixed 2DPC DDR5 2 Rank	Value input	Override the reduced speed in mixed 2DPC config or non-POR 2DPC config. 0 = Auto, otherwise speed in MT/s
LCT Cmd Eye Width	Value input	LCT Cmd Eye Width. 0 = Auto
HOB Buffer Size	[Auto], [1B], [1KB], [Max (assuming 63KB total HOB size)]	Size to set HOB Buffer
Max TOLUD	[Dynamic], [1 GB], [1.25 GB], [1.5 GB], [1.75 GB], [2 GB], [2.25 GB], [2.5 GB], [2.75 GB], [3 GB], [3.25 GB], [3.5 GB]	Maximum Value of TOLUD. Dynamic assignment would adjust TOLUD automatically based on largest MMIO length of installed graphic controller
SA GV	[Disabled], [Enabled], [Fixed to 1st Point], [Fixed to 2nd Point], [Fixed to 3rd Point], [Fixed to 4th Point]	System Agent Geyserville. Can disable, fix to a specific point, or enable frequency switching.
Gear Ratio	Value input	Gear ratio when SAGV is disabled. 0 = Auto, 1 = G1, 2 = G2, 4 = G4
First / Second / Third / Fourth Point Frequency	Value input	Specify the frequency for the given point. 0 = MRC auto, Else a specific frequency as an integer: 1333
First / Second / Third / Fourth Point Gear	Value input	Gear ratio for this SAGV point. 0 = Auto, 1 = G1, 2 = G2, 4 = G4
SAGV Switch Factor IA	Value input	SAGV Switch Factor of IA Load Percentage To Trigger Switching Up And Down
SAGV Switch Factor GT	Value input	SAGV Switch Factor of GT Load Percentage To Trigger Switching Up And Down
SAGV Switch Factor IO	Value input	SAGV Switch Factor of IO Load Percentage To Trigger Switching Up And Down
SAGV Switch Factor Stall	Value input	SAGV Switch Factor of IA / GT Stall Percentage To Trigger Switching Up And Down
Threshold For Switch Up	Value input	Duration In MS Of High Activity After Which SAGV Will Switch Up
Threshold For Switch Down	Value input	Duration In MS Of Low Activity After Which SAGV Will Switch Down

Feature	Option	Description
Retrain on Fast Fail	[Disabled], [Enabled]	Restart MRC in Cold mode if SW MemTest fails during Fast flow. Default = Enabled
DDR4_1DPC	[Disabled], [Enabled on DIMM0 only], [Enabled on DIMM1 only], [Enabled]	DDR4 1DPC performance feature for 2R DIMMs. Can be enabled on DIMM0 or DIMM1 only, or on both
Row Hammer Mode	[Disabled], [RFM], [pTRR]	Row Hammer Prevention Mode. RFM will fall back to pTRR if not available.
RH LFSR0/1 Mask	[1/2^1], [1/2^2], [1/2^3], [1/2^4], [1/2^5], [1/2^6], [1/2^7], [1/2^8], [1/2^9], [1/2^10], [1/2^11], [1/2^12], [1/2^13], [1/2^14], [1/2^15]	LFSR0/1 mask for RH pTRR
MC Refresh Rate	[NORMAL Refresh], [2x Refresh], [4x Refresh]	Select refresh rate on the MC
Refresh Watermarks	[Low], [High]	Sets Refresh Panic Watermark and Refresh High-Priority Watermark to HIGH or LOW values
LPDDR ODT RttWr / RttCa	Value input	Initial RttWr / RttCa ODT override for LP4/5 in Ohms. Range 0x01 – 0xFF Default 0 = AUTO
Exit On Failure (MRC)	[Disabled], [Enabled]	Exit On Failure for MRC training steps
New Features 1 / 2 - MRC	[Disabled], [Enabled]	Enabling / Disabling Generic New Features 1 / 2
Ch Hash Override	[Disabled], [Enabled]	Override Channel Hash settings
Ch Hash Support	[Disabled], [Enabled]	Enable / Disable Channel Hash Support. Note: ONLY if memory interleaved Mode
Ch Hash Mask	Value input	Set the BIT(s) to be included in the XOR function. NOTE BIT mask corresponds to BITS [19:6]
Ch Hash Interleaved Bit	[BIT6], [BIT7], [BIT8], [BIT9], [BIT10], [BIT11], [BIT12], [BIT13]	Select the BIT to be used for Channel Interleaved mode. NOTE: BIT7 will interleave the channels at a 2 cacheline granularity, BIT8 at 4 and BIT9 at 8.
Extended Bank Hashing	[Disabled], [Enabled]	Enable / disable Extended Bank Hashing.
Per Bank Refresh	[Disabled], [Enabled]	Enables and Disables the per bank refresh. This only impacts memory technologies that support PBR: LPDDR4, LPDDR5 and DDR5.
VC1 Read Metering	[Disabled],	Enable / Disable VC1 Read Metering Feature (RdMeter)

Feature	Option	Description
	[Enabled]	
Strong Weak Leaker	Value input	Value for StrongWKLeaker
Power Down Mode	[Auto], [No Power Down], [APD], [PPD-DLLoff]	CKE Power Down Mode Control
Pwr Down Idle Timer	Value input	The minimum value should = to the worst case Roundtrip delay + Burst_Length. 0 means AUTO, 64 for ULX/ULT, 128 for DT/Halo
Page Close Idle Timeout	[Enabled], [Disabled]	Page Close Idle Timeout Control
Memory Scrambler	[Disabled], [Enabled]	Enable / Disable Memory Scrambler support.
Force ColdReset	[Enabled], [Disabled]	Force ColdReset OR Choose MrcColdBoot mode, when Coldboot is required during MRC execution. Note: If ME 5.0MB is present, ForceColdReset is required!
Controller 0 / 1, Channel 0 / 1 / 2 / 3 Control	[Enabled], [Disabled]	Controller 0 / 1, Channel 0 / 1 / 2 / 3 Control – Enable or Disable Controller 0 / 1, Channel 0 / 1 / 2 / 3.
Force Signal Rank	[Disabled], [Enabled]	When enabled, only Rank 0 will be used in each DIMM
Memory Remap	[Enabled], [Disabled]	Enable / Disable Memory Remap above 4GB
Time Measure	[Disabled], [Enabled]	Enable / Disable printing of the time it takes to execute MRC.
Fast Boot	[Disabled], [Enabled]	Enable / Disable fast path thru the MRC
Rank Margin Tool Per Task	[Disabled], [Enabled]	Enable / Disable RMT running at every major training step
Tarining Tracing	[Disabled], [Enabled]	Enables / Disables printing of the current trained state at every major training step.
Lpddr Mem WL Set	[Set A], [Set B]	Only applicable to LPDDR, Memory Write Latency Set selection (A is default, B will be used if memory devices support it)
BDAT Memory Test Type	[Rank Margin Tool Rank]	Read only item
Rank Margin Tool Loop Count	Value input	Specifies the Loop Count to be used during Rank Margin Tool Testing. 0 = AUTO
ECC DFT	[Disabled], [Enabled]	Enable / Disable ECC DFT feature
Write0	[Disabled], [Enabled]	Write0 feature for LP5/DDR5
Periodic DCC	[Disabled], [Enabled]	Enable / Disable Periodic DCC

Feature	Option	Description
LPMode	[Auto], [Enabled], [Disabled]	Control LPMode feature
PPR Enable	[Disabled], [Hard PPR]	PPR permanently repairs failed rows (if possible).
SAM Overlaoding	[Disabled], [Enabled]	[Enabled]: copy the sagv frequency point. [Disabled]: not copy.

Figure 141: BIOS Chipset Setup Menu – System Agent (SA) Configuration – Memory Configuration – Memory Thermal Configuration

Aptio Setup – AMI		
Chipset		
Memory Thermal Configuration		
> Memory Power and Thermal Throttling		→←: Select Screen
Memory Thermal Management	[Enabled]	↑ ↓: Select Item
PECI Injected Temperature*	[Disabled]	Enter: Select
EXTTS# via TS-on-Board*	[Disabled]	+/-: Change Opt.
EXTTS# via TS-on-DIMM*	[Disabled]	F1: General Help
Virtual Temperature Sensor (VTS)*	[Disabled]	F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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* These items appear only when enabling Memory Thermal Management.

Feature	Option	Description
Memory Thermal Management	[Disabled], [Enabled]	Enable / Disable Memory Thermal Management.
PECI Injected Temperature	[Disabled], [Enabled]	Enable / Disable memory temperatures to be injected to the processor via PECI.
EXTTS# via TS-on-Board	[Disabled], [Enabled]	Enable / Disable routing TS-on-Board's ALERT# and THERM# to EXTTS# pins on the PCH.
EXTTS# via TS-on-DIMM	[Disabled], [Enabled]	Enable / Disable routing TS-on-DIMM's ALERT# to EXTTS# pin on the PCH.
Virtual Temperature Sensor (VTS)	[Disabled], [Enabled]	Enable / Disable Virtual Temperature Sensor (VTS).

Figure 142: BIOS Chipset Setup Menu – System Agent (SA) Configuration – Memory Configuration – Memory Thermal Configuration – Memory Power and Thermal Throttling

Aptio Setup – AMI		
Chipset		
Memory Power and Thermal Throttling		
DDR PowerDown and idle counter	[BIOS]	
For LPDDR Only: DDR PowerDown and idle counter	[BIOS]	
REFRESH_2X_MODE	[2- Enabled HOT only]	→←: Select Screen
SelfRefresh Enable	[Enabled]	↑ ↓: Select Item
SelfRefresh IdleTimer	512	Enter: Select
Throttler CKEMin Defeature	[Enabled]	+/-: Change Opt.
Throttler CKEMin Timer	0	F1: General Help
Allow Opp Ref Below Write Threhold	[Disabled]	F2: Previous Values
Write Threshold	0	F3: Optimized Defaults
For LPDDR only: Throttler CKEMin Defeature	[Enabled]	F4: Save & Exit
For LPDDR only: Throttler CKEMin Timer	0	ESC: Exit
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Feature	Option	Description
DDR PowerDown and idle counter	[PCODE], [BIOS]	[BIOS]: BIOS is in control of DDR CKE mode and idle timer value. [PCODE]: pcode will manage the modes.
For LPDDR Only: DDR PowerDown and idle counter	[PCODE], [BIOS]	For LPDDR Only [BIOS]: BIOS is in control of DDR CKE mode and idle timer value. [PCODE]: pcode will manage the modes.
REFRESH_2X_MODE	[Disabled], [1-Enabled for WARM or HOT], [2- Enabled HOT only]	0 – Disabled 1 – iMC enables 2xRef when Warm and Hot 2 – iMC enables 2xRef when Hot
SelfRefresh Enable	[Disabled], [Enabled]	Enable = Def
SelfRefresh IdleTimer	Value input	Range [64K-1;512] in DLCK800s, (512 = Def)
Throttler CKEMin Defeature	[Enabled], [Disabled]	Enable or disable Throttler CKEMin Defeature
Throttler CKEMin Timer	Value input	Timer value for CKEMin, range [255;0]. Req'd min of SC_ROUND_T + BYTE_LENGTH (4)
Allow Opp Ref Below Write Threhold	[Disabled], [Enabled]	Allow opportunistic refreshes while we don't exit power down.
Write Threshold	Value input	Number of writes that can be accumulated while CKE is low before CKE is asserted.
For LPDDR Only: Throttler CKEMin Defeature	[Enabled], [Disabled]	For LPDDR Only Enable or disable Throttler CKEMin Defeature

Feature	Option	Description
For LPDDR Only: Throttler CKEMin Timer	Value input	For LPDDR Only: Timer value for CKEMin, range [255;0]. Req'd min of SC_ROUND_T + BYTE_LENGTH (4)

Figure 143: BIOS Chipset Setup Menu – System Agent (SA) Configuration – Memory Configuration – Memory Training Algorithms

Aptio Setup – AMI		
Chipset		
Early Command Training	[Enabled]	
SenseAmp Offset Training	[Disabled]	
Early ReadMPR Timing Centering 2D	[Enabled]	
Read MPR Training	[Disabled]	
Receive Enable Training	[Enabled]	
Jedec Write Leveling	[Enabled]	
Early Write Time Centering 2D	[Enabled]	
Early Read Time Centering 2D	[Enabled]	
Write Timing Centering 1D	[Enabled]	
Write Voltage Centering 1D	[Enabled]	
Read Timing Centering 1D	[Enabled]	
Dimm ODT Training*	[Enabled]	
Max RTT_WR (1)	[ODT Off]	
DIMM RON Training*	[Disabled]	
Write Drive Strength / Equalization 2D*	[Disabled]	
Write Slew Rate Training*	[Enabled]	
Read ODT Training*	[Enabled]	
Read Equalization Training*	[Enabled]	
Read Amplifier Training*	[Enabled]	
Write Timing Centering 2D	[Enabled]	
Read Timing Centering 2D	[Enabled]	
Command Voltage Centering	[Enabled]	
Write Voltage Centering 2D	[Enabled]	
Read Voltage Centering 2D	[Enabled]	
Late Command Training	[Enabled]	
Round Trip Latency	[Enabled]	
Turn Around Timing Training	[Disabled]	
CMD CTL CLK Slew Rate	[Enabled]	
CMD/CTL DS & E 2D	[Enabled]	
Read Voltage Centering 1D	[Enabled]	
TxDqTCO Comp Training*	[Enabled]	
ClkTCO Comp Training*	[Enabled]	
TxDqsTCO Comp Training*	[Enabled]	

Aptio Setup – AMI		
Chipset		
VccDLL Bypass Training	[Enabled]	
CMD/CTL Drive Strength Up/Dn 2D	[Enabled]	
DIMM CA ODT Training	[Enabled]	
PanicVttDnLp Training*	[Enabled]	
Read Vref Decap Training*	[Enabled]	
Vddq Training	[Disabled]	
Duty Cycle Correction Training	[Enabled]	
Rank Margin Tool Per Bit	[Disabled]	
DIMM DFE Training	[Enabled]	
EARLY DIMM DFE Training	[Enabled]	
Tx Dqs Dcc Training	[Enabled]	
DRAM DCA Training	[Enabled]	
Write Driver Strength Training	[Enabled]	
Rank Margin Tool	[Disabled]	→ ←: Select Screen
Memory Test	[Disabled]	↑ ↓: Select Item
DQS OFFSET ADJUST Training	[Enabled]	Enter: Select
DIMM SPD Alias Test	[Disabled]	+/-: Change Opt.
Receive Enable Centering 1D	[Enabled]	F1: General Help
Retrain Margin Check	[Disabled]	F2: Previous Values
Write Drive Strength Up/Dn independently	[Enabled]	F3: Optimized Defaults
Margin Check Limit	[Disabled]	F4: Save & Exit
Maring Limit Check L2 (2)	100	ESC: Exit
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(1) This item activates only when enabling Read Timing Centering 1D.
(2) This item activates only when selecting L2 or Both for Margin Check Limit.

Feature	Option	Description
Early Command Training	[Disabled], [Enabled]	Enable or disable Early Command Training
SenseAmp Offset Training	[Disabled], [Enabled]	Enable or disable SenseAmp Offset Training
Early ReadMPR Timing Centering 2D	[Disabled], [Enabled]	Enable or disable Early ReadMPR Timing Centering 2D
Read MPR Training	[Disabled], [Enabled]	Enable or disable Read MPR Training
Receive Enable Training	[Disabled], [Enabled]	Enable or disable Receive Enable Training
Jedec Write Leveling	[Disabled], [Enabled]	Enable or disable Jedec Write Leveling
Early Write Time Centering 2D	[Disabled], [Enabled]	Enable or disable Early Write Time Centering 2D

Feature	Option	Description
Early Read Time Centering 2D	[Disabled], [Enabled]	Enable or disable Early Read Time Centering 2D
Write Timing Centering 1D	[Disabled], [Enabled]	Enable or disable Write Timing Centering 1D
Write Voltage Centering 1D	[Disabled], [Enabled]	Enable or disable Write Voltage Centering 1D
Read Timing Centering 1D	[Disabled], [Enabled]	Enable or disable Read Timing Centering 1D
Dimm ODT Training*	[Disabled], [Enabled]	Dimm On-Die Termination Training*
Max RTT_WR	[ODT Off], [120 Ohms]	Caps the maximum RTT_WR in power training.
DIMM RON Training*	[Disabled], [Enabled]	Enable or disable DIMM RON Training*
Write Drive Strength / Equalization 2D*	[Disabled], [Enabled]	Enable or disable Write Drive Strength / Equalization 2D*
Write Slew Rate Training*	[Disabled], [Enabled]	Enable or disable Write Slew Rate Training*
Read ODT Training*	[Disabled], [Enabled]	Read On-Die Termination Training*
Read Equalization Training*	[Disabled], [Enabled]	Enable or disable Read Equalization Training*
Read Amplifier Training*	[Disabled], [Enabled]	Enable or disable Read Amplifier Training*
Write Timing Centering 2D	[Disabled], [Enabled]	Write Dq-Dqs Timing Centering 2D
Read Timing Centering 2D	[Disabled], [Enabled]	Read Dq-Dqs Timing Centering 2D
Command Voltage Centering	[Disabled], [Enabled]	Enable or disable Command Voltage Centering
Write Voltage Centering 2D	[Disabled], [Enabled]	Enable or disable Write Voltage Centering 2D
Read Voltage Centering 2D	[Disabled], [Enabled]	Enable or disable Read Voltage Centering 2D
Late Command Training	[Disabled], [Enabled]	Enable or disable Late Command Training
Round Trip Latency	[Disabled], [Enabled]	Enable or disable Round Trip Latency Training
Turn Around Timing Training	[Disabled], [Enabled]	Enable or disable Turn Around Timing Training
CMD CTL CLK Slew Rate	[Disabled], [Enabled]	Enable or disable CMD CTL CLK Slew Rate

Feature	Option	Description
CMD/CTL DS & E 2D	[Disabled], [Enabled]	CMD/CTL Drive Strength and Equalization 2D
Read Voltage Centering 1D	[Disabled], [Enabled]	Enable or disable Read Voltage Centering 1D
TxDqTCO Comp Training*	[Disabled], [Enabled]	Enable or disable TxDqTCO Comp Training*
ClkTCO Comp Training*	[Disabled], [Enabled]	Enable or disable ClkTCO Comp Training*
TxDqsTCO Comp Training*	[Disabled], [Enabled]	Enable or disable TxDqsTCO Comp Training*
VccDLL Bypass Training	[Disabled], [Enabled]	Enable or disable VccDLL Bypass Training
CMD/CTL Drive Strength Up/Dn 2D	[Disabled], [Enabled]	Enable or disable CMD/CTL Drive Strength Up/Dn 2D
DIMM CA ODT Training	[Disabled], [Enabled]	Enable or disable DIMM CA ODT Training
PanicVttDnLP Training*	[Disabled], [Enabled]	Enable or disable PanicVttDnLp Training*
Read Vref Decap Training	[Disabled], [Enabled]	Enable or disable Vref Decap Training*
Vddq Training	[Disabled], [Enabled]	Enable or disable Vddq Training
Duty Cycle Correction Training	[Disabled], [Enabled]	Enable or disable Duty Cycle Correction Training
Rank Margin Tool Per Bit	[Disabled], [Enabled]	Enable or disable Rank Margin Tool Per Bit
DIMM DFE Training	[Disabled], [Enabled]	Enable or disable DIMM DFE Training
EARLY DIMM DFE Training	[Disabled], [Enabled]	Enable or disable EARLY DIMM DFE Training
Tx Dqs Dcc Training	[Disabled], [Enabled]	Enable or disable Tx Dqs duty cycle Training
DRAM DCA Training	[Disabled], [Enabled]	Enable or disable DRAM DCA Training
Write Driver Strength Training	[Disabled], [Enabled]	Enable or disable Write Driver Strength Training
Rank Margin Tool	[Disabled], [Enabled]	Enable or disable Rank Margin Tool Training
Memory Test	[Disabled], [Enabled]	Enable or disable Memory Test Training
DQS OFFSET ADJUST Training	[Disabled], [Enabled]	Enable or disable DQS OFFSET ADJUST Training

Feature	Option	Description
DIMM SPD Alias Test	[Disabled], [Enabled]	Enable or disable DIMM SPD Alias Test
Receive Enable Centering 1D	[Disabled], [Enabled]	Enable or disable Receive Enable Centering 1D
Retrain Margin Check	[Disabled], [Enabled]	Enable or disable Retrain Margin Check
Write Drive Strength Up/Dn independently	[Disabled], [Enabled]	Enable or disable Write Drive Strength Up/Dn independently
Margin Check Limit	[Disabled], [L1], [L2], [Both]	Checks Margin to Limit to see if next boot memory needs to be retrain
Margin Limit Check L2	Value input	L2 check threshold is scale of L1 check. Ex. 200 is 2x L1 Check

Figure 144: BIOS Chipset Setup Menu – System Agent (SA) Configuration – Graphics Configuration

Aptio Setup – AMI		
Chipset		
Graphics Configuration		
Graphics Turbo IMON Current	31	
Skip Scaning of External Gfx Card	[Disabled]	
> External Gfx Card Primary Display Configuration		
GTT Size	[8MB]	
PSMI SUPPORT	[Disabled]	
PSMI Region Size (1)	[32MB]	
Intel Graphics Pei Display Peim	[Disabled]	
VDD Enable	[Enabled]	
Configure GT for use	[Enabled]	→←: Select Screen
RC1p Support (2)	[Disabled]	↑ ↓: Select Item
PAVP Enable	[Enabled]	Enter: Select
Cdynmax Clamping Enable	[Disabled]	+/-: Change Opt.
Cd Clock Frequency	[Max CdClock freq based on Reference Clk]	F1: General Help
Enable Display Audio Link in Pre-OS	[Disabled]	F2: Previous Values
IUER Button Enable	[Disabled]	F3: Optimized Defaults
> LCD Control		F4: Save & Exit
> Intel® Ultrabook Event Support		ESC: Exit
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(1) This item appears only when enabling PSMI SUPPORT.
(2) This item appears only when enabling Configure GT for use.

Feature	Option	Description
Graphics Turbo IMON Current	Value input	Graphics turbo IMON current values supported (14 - 31)
Skip Scaning of External Gfx Card	[Disabled], [Enabled]	If Enable, it will not scan for External Gfx Card on PEG and PCH PCIE Ports
GTT Size	[2MB], [4MB], [8MB]	Select the GTT Size
PSMI SUPPORT	[Disabled], [Enabled]	PSMI Enable / Disable
PSMI Region Size	[32MB], [288MB], [544MB], [800MB], [1024MB]	Select the PSMI Region Size: Range from 32MB to 1024MB
Intel Graphics Pei Display Peim	[Enabled], [Disabled]	Enable / Disable Pei (Early) Display
VDD Enable	[Disabled], [Enabled]	Enable / Disable forcing of VDD in the BIOS
Configure GT for use	[Enabled], [Disabled]	Enable / Disable GT configuration in BIOS
RC1p Support	[Enabled], [Disabled]	Enable / Disable RC1p support. If RC1p is enabled, send a RC1p frequency request to PMA based other conditions being met
PAVP Enable	[Enabled], [Disabled]	Enable / Disable PAVP
Cdynmax Clamping Enable	[Enabled], [Disabled]	Enable / Disable Cdynmax Clamping
Cd Clock Frequency	[192 Mhz], [307.2 Mhz], [556.8 Mhz], [652.8 Mhz], [Max CdClock freq based on Reference Clk]	Select the highest Cd Clock frequency supported by the platform
Enable Display Audio Link in Pre-OS	[Disabled], [Enabled]	[Enabled]: Display Audio Link will be enabled in Pre-OS. [Disabled]: Display Audio Link will be disabled in Pre-OS.
IUER Button Enable	[Disabled], [Enabled]	Enable / Disable IUER Button Functionality

Figure 145: BIOS Chipset Setup Menu – System Agent (SA) Configuration – Graphics Configuration – External Gfx Card Primary Display Configuration

Aptio Setup – AMI	
Chipset	
External Gfx Card Primary Display Configuration	
	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Figure 146: BIOS Chipset Setup Menu – System Agent (SA) Configuration – Graphics Configuration – LCD Control

Aptio Setup – AMI		
Chipset		
LCD Control		
LCD Panel Type	[VBIOS Default]	→←: Select Screen
Panel Scaling	[Auto]	↑ ↓: Select Item
Backlight Control	[PWM Normal]	Enter: Select
Active LFP	[eDP Port-A]	+/-: Change Opt.
Panel Color Depth	[18 Bit]	F1: General Help
Backlight Brightness	255	F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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Feature	Option	Description
LCD Panel Type	[VBIOS Default], [640x480 LVDS], [800x600 LVDS], [1024x768 LVDS], [1280x1024 LVDS], [1400x1050 LVDS1], [1400x1050 LVDS2], [1600x1200 LVDS], [1280x768 LVDS], [1680x1050 LVDS],	Select LCD panel used by Internal Graphics Device by selecting the appropriate setup item.

Feature	Option	Description
	[1920x1200 LVDS], [1600x900 LVDS], [1280x800 LVDS], [1280x600 LVDS], [2048x1536 LVDS], [1366x768 LVDS]	
Panel Scaling	[Auto], [Off], [Force Scaling]	Select the LCD panel scaling option used by the Internal Graphics Device.
Backlight Control	[PWM Inverted], [PWM Normal]	Back Light Control Setting
Active LFP	[No eDP], [eDP Port-A]	Select the Active LFP Configuration. [No LVDS]: VBIOS does not enable LVDS. [Int-LVDS]: VBIOS enables LVDS driver by Integrated encoder. [SDVO LVDS]: VBIOS enables LVDS driver by SDVO encoder. [eDP Port-A]: LFP Driven by Int-DisplayPort encoder from Port-A. [eDP Port-D]: LFP Driven by Int-DisplayPort encoder from Port-D (through PCH).
Panel Color Depth	[18 Bit], [24 Bit]	Select the LFP Panel Color Depth
Backlight Brightness	Value input	Set VBIOS Brightness. Range: 0 – 255.

Figure 147: BIOS Chipset Setup Menu – System Agent (SA) Configuration – Graphics Configuration – Intel® Ultrabook Event Support

Aptio Setup – AMI		
Chipset		
Intel® Ultrabook Event Support		
IUER Slate Enable	[Disabled]	→←: Select Screen
Slate Mode boot value (1)	[Laptop Mode]	↑ ↓: Select Item
Slate Mode on S3 and S4 resume (1)	[No change]	Enter: Select
IUER Dock Enable	[Disabled]	+/-: Change Opt.
Dock Mode boot value (2)	[Undocked]	F1: General Help
Dock Mode upon S3 and S4 resume (2)	[No change]	F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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(1) These items appear only when enabling IUER Slate Enable.
(2) These items appear only when enabling IUER Dock Enable.

Feature	Option	Description
IUER Slate Enable	[Disabled], [Enabled]	Enable / Disable IUER Slate Functionality
Slate Mode boot value	[Slate Mode], [Laptop Mode]	Choose Slate or Laptop as boot mode.
Slate Mode on S3 and S4 resume	[No change], [Toggle]	Keep it the same as Sx entry or toggle it.
IUER Dock Enable	[Disabled], [Enabled]	Enable / Disable IUER Dock Functionality
Dock Mode boot value	[Undocked], [Docked]	Choose Docked or Undocked as boot mode.
Dock Mode upon S3 and S4 resume	[No change], [Toggle]	Keep it the same as Sx entry or toggle it.

Figure 148: BIOS Chipset Setup Menu – System Agent (SA) Configuration – DMI/OPI Configuration

Aptio Setup – AMI		
Chipset		
DMI/OPI Configuration		
CDR Relock for CPU DMI	[Disabled]	→←: Select Screen
DMI Gen3 Eq Phase 2	[Auto]	↑ ↓: Select Item
DMI Gen3 Eq Phase 3 Method	[Auto]	Enter: Select
DMI Gen3 ASPM	[ASPM L1]	+/-: Change Opt.
DMI ASPM	[ASPM L1]	F1: General Help
DMI Gen3 L1 Exit Latency	4	F2: Previous Values
New FOM for CPU DMI	[Disabled]	F3: Optimized Defaults
> DMI Advanced Menu		F4: Save & Exit
		ESC: Exit
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Feature	Option	Description
CDR Relock for CPU DMI	[Disabled], [Enabled]	Keep it the same as Sx entry or toggle it.
DMI Gen3 Eq Phase 2	[Disabled], [Enabled], [Auto]	Perform Gen3 Equalization Phase 2
DMI Gen3 Eq Phase 3 Method	[Auto], [Adaptive Hardware Equalization], [Adaptive Software Equalization], [Static Equalization], [Disabled]	Select Method foe Gen3 Equalization Phase 3

Feature	Option	Description
DMI Gen3 ASPM	[Disabled], [Auto], [ASPM L0s], [ASPM L1], [ASPM L0sL1]	DMI Gen3 ASPM Support
DMI ASPM	[Disabled], [Auto], [ASPM L0s], [ASPM L1], [ASPM L0sL1]	DMI ASPM Support
DMI Gen3 L1 Exit Latency	Value input	DMI Gen3 L1 Exit Latency
New FOM for CPU DMI	[Disabled], [Enabled]	Enable / Disable New FOM

Figure 149: BIOS Chipset Setup Menu – System Agent (SA) Configuration – DMI/OPI Configuration – DMI Advanced Menu

Aptio Setup – AMI		
Chipset		
DMI Advanced Menu		
DMI Gen4 EQ Mode	[HW EQ]	
DMI Gen4 RTCO Cpre Lane0	0	
DMI Gen4 RTCO Cpost Lane0	0	
DMI Gen4 RTCO Cpre Lane1	14	
DMI Gen4 RTCO Cpost Lane1	7	
DMI Gen4 RTCO Cpre Lane2	10	
DMI Gen4 RTCO Cpost Lane2	6	
DMI Gen4 RTCO Cpre Lane3	7	
DMI Gen4 RTCO Cpost Lane3	7	
DMI Gen4 RTCO Cpre Lane4	7	
DMI Gen4 RTCO Cpost Lane4	7	
DMI Gen4 RTCO Cpre Lane5	7	
DMI Gen4 RTCO Cpost Lane5	7	
DMI Gen4 RTCO Cpre Lane6	7	
DMI Gen4 RTCO Cpost Lane6	7	
DMI Gen4 RTCO Cpost Lane7	7	
DMI Gen4 RTCO Cpre Lane7	7	
DMI Gen3 RTCO Cpre Lane0	0	
DMI Gen3 RTCO Cpost Lane0	0	
DMI Gen3 RTCO Cpre Lane1	0	
DMI Gen3 RTCO Cpost Lane1	0	

Aptio Setup – AMI		
Chipset		
DMI Gen3 RTCO Cpre Lane2	0	
DMI Gen3 RTCO Cpost Lane2	0	
DMI Gen3 RTCO Cpre Lane3	0	
DMI Gen3 RTCO Cpost Lane3	0	→←: Select Screen
DMI Gen3 RTCO Cpre Lane4	0	↑ ↓: Select Item
DMI Gen3 RTCO Cpost Lane4	0	Enter: Select
DMI Gen3 RTCO Cpre Lane5	0	+/-: Change Opt.
DMI Gen3 RTCO Cpost Lane5	0	F1: General Help
DMI Gen3 RTCO Cpre Lane6	0	F2: Previous Values
DMI Gen3 RTCO Cpost Lane6	0	F3: Optimized Defaults
DMI Gen3 RTCO Cpre Lane7	0	F4: Save & Exit
DMI Gen3 RTCO Cpost Lane7	0	ESC: Exit
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Feature	Option	Description
DMI Gen4 EQ Mode	[Disabled], [Fixed EQ], [HW EQ]	DMI Gen4 EQ Mode
DMI Gen4 RTCO Cpre Lane0/1/2/3/4/5/6/7	Value input	DMI Gen4 Lane Transmitter Pre-Cursor Coefficient values.
DMI Gen4 RTCO Cpost Lane0/1/2/3/4/5/6/7	Value input	DMI Gen4 Lane Transmitter Post-Cursor Coefficient values.
DMI Gen3 RTCO Cpost Lane0/1/2/3/4/5/6/7	Value input	DMI Gen3 Lane Transmitter Pre-Cursor Coefficient values.
DMI Gen3 RTCO Cpre Lane0/1/2/3/4/5/6/7	Value input	DMI Gen3 Lane Transmitter Post-Cursor Coefficient values.

Figure 150: BIOS Chipset Setup Menu – System Agent (SA) Configuration – TCSS setup menu

Aptio Setup – AMI	
Chipset	
TCSS Configuration IOM FW version: 23000800 PHY FW version: 0FA7 TBT FW IMR Status: 00000000 TBT FW version: N/A	

Aptio Setup – AMI		
Chipset		
Deepest TC state: 0000		
TCSS xHCI Support	[Enabled]	→←: Select Screen
> TCSS USB Configuration*		↑ ↓: Select Item
VCCST status of IOM*	[Enabled]	Enter: Select
D3 Cold Enable/Disable*	[Disabled]	+/-: Change Opt.
D3Hot*	[Disabled]	F1: General Help
Tc C-State Limit*	[Disabled]	F2: Previous Values
TC Cold Power Saving Factor*	[Disabled]	F3: Optimized Defaults
IOM before entering TC cold*(1)	10	F4: Save & Exit
IOM stay in TC cold*(1)	50	ESC: Exit
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* These items appear only when enabling TCSS xHCI Support.
(1) These items appear only when enabling TC Cold Power Saving Factor.

Feature	Option	Description
TCSS xHCI Support	[Disabled], [Enabled]	Enable / Disable TCSS xHCI
VCCST status of IOM	[Disabled], [Enabled]	Enables / Disables VCCST. [Enabled]: Sends VCCST ON message to EC or PMC. [Disabled]: Sends VCCST OFF message to EC or PMC.
D3 Cold Enable / Disable	[Disabled], [Enabled]	Enables / Disables D3 Cold. [Enabled]: D3 cold support for IOM is enabled. [Disabled]: D3 cold support for IOM is disabled.
D3Hot	[Disabled], [Enabled]	Enables / Disables D3 Hot. [Enabled]: D3 Hot support for IOM is enabled. [Disabled]: D3 Hot support for IOM is disabled.
Tc C-State Limit	[Disabled], [1], [2], [4], [5], [6], [7], [10]	BIOS mailbox to limit deepest TCx state
TC Cold Power Saving Factor	[Disabled], [Enabled]	TC Cold Power Saving Factor Switch
IOM before entering TC cold	Value input	Represent Y in seconds for IOM before entering TC cold
IOM stay in TC cold	Value input	Represent X in seconds for IOM stays in TC cold

Figure 151: BIOS Chipset Setup Menu – System Agent (SA) Configuration – Display setup menu

Aptio Setup – AMI	
Chipset	
Display Configurations	
	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Figure 152: BIOS Chipset Setup Menu – System Agent (SA) Configuration – PCI Express Configuration

Aptio Setup – AMI		
Chipset		
PCI Express Configuration		
Fia Programming	[Enabled]	→←: Select Screen
Compliance Test Mode	[Disabled]	↑ ↓: Select Item
CDR Relock	[Enabled]	Enter: Select
Assertion on Link Down GPIOs	[Disabled]	+/-: Change Opt.
PCI Express Slot Selection	[M2]	F1: General Help
> PCI Express Root Port 1		F2: Previous Values
> PCI Express Root Port 2		F3: Optimized Defaults
> PCI Express Root Port 3		F4: Save & Exit
		ESC: Exit
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Feature	Option	Description
Fia	[Disabled], [Enabled]	Load Fia Configuration if Enabled for each root port.
Compliance Test Mode	[Disabled], [Enabled]	Enable when using Compliance Load Board
CDR Relock	[Disabled], [Enabled]	Enable / Disable CDR Relock
Assertion on Link Down GPIOs	[Disabled], [Enabled]	GPIO Assertion on Link Down

Feature	Option	Description
PCI Express Slot Selection	[M2], [CEMx4 slot]	Select the PCIe M2 or CEMx4 slot

Figure 153: BIOS Chipset Setup Menu – System Agent (SA) Configuration – PCI Express Configuration – PCI Express Root Port 1/2/3

Aptio Setup – AMI		
Chipset		
PCI Express Root Port 1/2/3	[Enabled]	
Connection Type*	[Slot]	
PCI Express Clock Gating*	[Disabled]	
PCI Express Power Gating*	[Disabled]	
ASPM*	[Disabled]	
L1 Substates*	[L1.1 & L1.2]	
Gen3 Eq Phase3 Method*	[Hardware]	
Gen4 Eq Phase3 Method*	[Hardware]	
ACS*	[Enabled]	
PTM*	[Enabled]	
DPC*	[Disabled]	
FOM Scoreboard Control Policy*	[Auto]	
Multi-VC*	[Disabled]	
EDPC*	[Enabled]	
URR*	[Disabled]	
FER*	[Disabled]	
NFER*	[Disabled]	
CER*	[Disabled]	
CTO*	[Disabled]	
SEFE*	[Disabled]	
SENFE*	[Disabled]	
SECE*	[Disabled]	
PME SCI*	[Enabled]	
Hot Plug*(3)	[Disabled]	
Advanced Error Reporting*	[Enabled]	
PCIe Speed*	[Auto]	
Enable ClockReq Messaging*	[Disabled]	
Transmitter Half Swing*	[Disabled]	
Detect Timeout*	0	
P2P Support*	[Disabled]	
CPU PCIE Func0 Link Disable*(3)	[Disabled]	
SA PCIe LTR Configuration*		
LTR*	[Enabled]	

Aptio Setup – AMI		
Chipset		
Snoop Latency Override*#	[Auto]	
Snoop Latency Value*#(1)	60	
Snoop Latency Multiplier*#(1)	[1024 ns]	
Non Snoop Latency Override*#	[Auto]	
Non Snoop Latency Value*#(2)	60	
Non Snoop Latency Multiplier*#(2)	[1024 ns]	
Force LTR Override*#	[Disabled]	
LTR Lock*	[Disabled]	
CPU PCIe Gen3 HWEQ Config		
UPTP	5	
DPTP	7	→←: Select Screen
		↑ ↓: Select Item
CPU PCIe Gen4 HWEQ Config		Enter: Select
UPTP	8	+/-: Change Opt.
DPTP	9	F1: General Help
		F2: Previous Values
CPU PCIe Gen5 HWEQ Config		F3: Optimized Defaults
UPTP (5)	5	F4: Save & Exit
DPTP (5)	7	ESC: Exit
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* These items appear only when enabling PCI Express Root Port 1/2/3.
# These items appear only when enabling LTR.
(1) These items appear only when selecting Manual for Snoop Latency Override.
(2) These items appear only when selecting Manual for Mon Snoop Latency Override.
(3) This item is available only for PCI Express Root Port 1/3.
(4) This item is available only for PCI Express Root Port 1.
(5) These items are available only for PCI Express Root Port 2.

Feature	Option	Description
PCI Express Root Port 1/2/3	[Disabled], [Enabled]	Control the PCI Express Root Port.
Connection Type	[Bulit-in], [Slot]	[Built-in]: a built-in device is connected to this rootport. SlotImplemented bit will be clear. [Slot]: this rootport connects to user-accessible slot. SlotImplemented bit will be set.
PCI Express Clock Gating	[Disabled], [Enabled]	PCI Express Clock Gating Enable / Disable for each root port.
PCI Express Power Gating	[Disabled], [Enabled]	PCI Express Power Gating Enable / Disable for each root port.
ASPM	[Disabled], [L0s],	Set the ASPM Level: Force L0s – Force all links to L0s State

Feature	Option	Description
	[L1], [L0sL1]	AUTO – BIOS auto configure DISABLE – Disables ASPM
L1 Substates	[L1.1 & L1.2]	Read only item
Gen3/4 Eq Phase3 Method	[Hardware], [Static Coeff.]	PCIe Gen3/4 Equalization Phase 3 Method
ACS	[Disabled], [Enabled]	Enable / Disable Access Control Services Extended Capability
PTM	[Disabled], [Enabled]	Enable / Disable Precision Time Measurement
DPC	[Disabled], [Enabled]	Enable / Disable Downstream Port Containment
FOM Scoreboard Control Policy	[Auto], [Gen3], [Gen4], [Gen3/Gen4], [Gen5]	Select the FOM Scoreboard Control Policy, when set to Auto, speed is based on TLS.
Multi-VC	[Disabled], [Enabled]	Enable / Disable Multi Virtual Channel
EDPC	[Disabled], [Enabled]	Enable / Disable Rootport extensions for Downstream Port Containment
URR	[Disabled], [Enabled]	PCI Express Unsupported Request Reporting Enable / Disable.
FER	[Disabled], [Enabled]	PCI Express Device Fatal Error Reporting Enable / Disable.
NFER	[Disabled], [Enabled]	PCI Express Device Non-Fatal Error Reporting Enable / Disable.
CER	[Disabled], [Enabled]	PCI Express Device Correctable Error Reporting Enable / Disable.
CTO	[Disabled], [Enabled]	PCI Express Completion Timer TO Enable / Disable.
SEFE	[Disabled], [Enabled]	Root PCI Express System Error on Fatal Error Enable / Disable.
SENFE	[Disabled], [Enabled]	Root PCI Express System Error on Non-Fatal Error Enable / Disable.
SECE	[Disabled], [Enabled]	Root PCI Express System Error on Correctable Error Enable / Disable.
PME SCI	[Disabled], [Enabled]	PCI Express PME SCI Enable / Disable.
Hot Plug	[Disabled], [Enabled]	PCI Express Hot Plug Enable / Disable.
Advanced Error Reporting	[Disabled], [Enabled]	Advanced Error Reporting Enable / Disable.
PCIe Speed	[Auto],	Configure PCIe Speed

Feature	Option	Description
	[Gen1], [Gen2], [Gen3], [Gen4], [Gen5]	Option [Gen5] only for PCI Express Root Port 2/3
Enable ClockReq Messaging	[Enabled], [Disabled]	Enable or Disable ClockReq Messaging
Transmitter Half Swing	[Disabled], [Enabled]	Transmitter Half Swing Enable / Disable.
Detect Timeout	Value input	The number of milliseconds reference code will wait for link to exit Detect state for enabled ports before assuming there is no device and potentially disabling the port.
P2P Support	[Disabled], [Enabled]	Program P2P Support Registers according to setup option
CPU PCIE Func0 Link Disable	[Disabled], [Enabled]	CPU PCIE Func0 Link Disable while Device attached into Port having Func0 and FuncN.
LTR	[Disabled], [Enabled]	SA PCIE Latency Reporting Enable / Disable
Snoop Latency Override	[Disabled], [Manual], [Auto]	Snoop Latency Override for SA PCIE. [Disabled]: Disable override. [Manual]: Manually enter override values. [Auto] (default): Maintain default BIOS flow.
Snoop Latency Value	Value input	LTR Snoop Latency value of SA PCIE
Snoop Latency Multiplier	[1 ns], [32 ns], [1024 ns], [32768 ns], [1048576 ns], [33554432 ns]	LTR Snoop Latency Multiplier of SA PCIE
Non Snoop Latency Override	[Disabled], [Manual], [Auto]	Non Snoop Latency Override for SA PCIE. [Disabled]: Disable override. [Manual]: Manually enter override values. [Auto] (default): Maintain default BIOS flow.
Non Snoop Latency Value	Value input	LTR Non Snoop Latency value of PCH PCIE
Non Snoop Latency Multiplier	[1 ns], [32 ns], [1024 ns], [32768 ns], [1048576 ns], [33554432 ns]	LTR Non Snoop Latency Multiplier of SA PCIE
Force LTR Override	[Disabled], [Enabled]	Force LTR Override for SA PCIE. [Disabled]: LTR override values will not be forced.

Feature	Option	Description
		[Enabled]: LTR override values will be forced and LTR messages from the device will be ignored.
LTR Lock	[Disabled], [Enabled]	PCIE LTR Configuration Lock
UPTP	Value input	Upstream Port Transmitter Preset
DPTP	Value input	Downstream Port Transmitter Preset

Figure 154: BIOS Chipset Setup Menu – System Agent (SA) Configuration – MIPI Camera Configuration

Aptio Setup – AMI		
Chipset		
CVF Support		
Control Logic 1	[Disabled]	
> Control Logic options*		
Control Logic 2	[Disabled]	
> Control Logic options*		
Control Logic 3	[Disabled]	
> Control Logic options*		
Control Logic 4	[Disabled]	
> Control Logic options*		
Camera1	[Disabled]	
> Link options#		→←: Select Screen
> Flash options#		↑ ↓: Select Item
Camera2	[Disabled]	Enter: Select
> Link options#		+/-: Change Opt.
> Flash options#		F1: General Help
Camera3	[Disabled]	F2: Previous Values
> Link options#		F3: Optimized Defaults
Camera4	[Disabled]	F4: Save & Exit
> Link options#		ESC: Exit
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* These items appear only when enabling Control Logic 1/2/3/4 respectively.
# These items appear only when enabling Camera1/2/3/4 respectively.

Feature	Option	Description
CVF Support	[Native IOs], [Disabled], [USB Bridge]	Disables / Enables CVF using either Native Ios or USB Ios Expansion.
Control Logic 1/2/3/4	[Disabled], [Enabled]	Disable / Enable Control Logic 1/2/3/4
Camera1/2/3/4	[Disabled], [Enabled]	Disable / Enable Camera1/2/3/4

Figure 155: BIOS Chipset Setup Menu – System Agent (SA) Configuration – MIPI Camera Configuration – Control Logic options

Aptio Setup – AMI		
Chipset		
Control Logic options		
Control Logic Type	[Discrete]	
CRD Version	[CRD-D]	
Input Clock (1)(2)(4)	[19.2 MHz]	
PCH Clock Source (1)(2)(4)	[IMGCLKOUT_0]	
PMIC Flash Panel (1)(2)(3)*	[Back]	
I2C Channel (2)(4)	[I2C3]	
I2C Address (2)(4)	4D	
WLED1 Type (2)	[White Led]	
WLED1 Flash Max Current (2)	0	
WLED1 Torch Max Current (2)	0	
WLED2 Type (2)	[IR Led]	
WLED2 Flash Max Current (2)	0	
WLED2 Torch Max Current (2)	0	
SubPlatformId (2)	0	
Number of GPIO Pins (1)(2)(3)	3	
GPIO 0 (1)(2)(3)		
Group Pad Number (1)(2)(3)	21	
Group Number (1)(2)(3)	[A]	
Function (1)(2)(3)	[Reset]	
Active Value (1)(2)(3)	1	
Initial Value (1)(2)(3)	0	
GPIO 1 (1)(2)(3)		
Group Pad Number (1)(2)(3)	23	
Group Number (1)(2)(3)	[B]	
Function (1)(2)(3)	[Power_En]	→←: Select Screen
Active Value (1)(2)(3)	1	↑ ↓: Select Item
Initial Value (1)(2)(3)	0	Enter: Select
GPIO 2 (1)(2)(3)		+/-: Change Opt.
Group Pad Number (1)(2)(3)	14	F1: General Help
Group Number (1)(2)(3)	[B]	F2: Previous Values
Function (1)(2)(3)	[pLED_En]	F3: Optimized Defaults
Active Value (1)(2)(3)	1	F4: Save & Exit
Initial Value (1)(2)(3)	0	ESC: Exit
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(1) These items appear when selecting Discrete for Control Logic Type.
(2) These items appear when selecting PMIC_TPS68470 or PMIC_UP6641 for Control Logic Type.
(3) These items appear when selecting PMIC_HDMI2MIPI_LT6911UXC for Control Logic Type.
(4) These items appear when selecting PMIC_USER0/1 for Control Logic Type.
* This item appears when selecting CRD-G or CRD-G2 for CRD Version.

Feature	Option	Description
Control Logic Type	[Discrete], [PMIC_TPS68470], [PMIC_UP6642], [PMIC_HDMI2MIPI_LT6911UXC], [PMIC_USER0], [PMIC_USER1]	Control Logic Type
CRD Version	[PTC], [CRD-G], [Kilshon-PPV], [CRD-D], [CRD-G2], [LT6911UXC-V1]	CRD Version
Input Clock	[24 MHz], [26 MHz], [20 MHz], [19.2 MHz]	Input Clock
PCH Clock Source	[IMGCLKOUT_0], [IMGCLKOUT_1], [IMGCLKOUT_2], [IMGCLKOUT_3], [IMGCLKOUT_4]	This option specifies which IMGCLKOUT is chosen
PMIC Flash Panel	[Front], [Back]	PMIC Flash Panel
I2C Channel	[I2C0], [I2C1], [I2C2], [I2C3], [I2C4], [I2C5], [I2C6], [I2C7]	I2C Channel
I2C Address	Value input	I2C Address
WLED1/2 Type	[Disabled], [White Led], [Warm Led], [IR Led], [Xeon Led]	WLED Type
WLED1/2 Flash Max Current	Value input	WLED Flash Max Current Valid range is 0x00-0x1F 0x00 for HW default max current
WLED1/2 Torch Max Current	Value input	WLED Torch Max Current Valid range is 0x00-0x07 0x00 for HW default max current
SubPlatformId	Value input	SubPlatformId
Number of GPIO Pins	Value input	Number of GPIO Pins
Group Pad Number	Value input	Group Pad Number

Feature	Option	Description
Group Number	[A], [B], [C], [E], [F], [H], [S], [T], [U], [D], [R]	Group Number
Function	[Reset], [Power_En], [Clock_En]. [pLED_En], [Strobe_En], [Handshake_En], [READY_STAT], [HDMI_DETECT]	Function
Active Value	Value input	Active Value
Initial Value	Value inpu	Initial Value

Figure 156: BIOS Chipset Setup Menu – System Agent (SA) Configuration – MIPI Camera Configuration – Link options

Aptio Setup – AMI		
Chipset		
Camera1/2/3/4		
Sensor Model	[OVTI01AS]	
Lanes Clock division	[4 4 2 2]	
CRD Version	[CRD-D]	
GPIO control	[Control Logic 1]	
Camera position	[Front]	
Flash Support	[Enabled]	
Privacy LED	[Driver default]	
Rotation	[0]	
PMIC Position*	[Position 1]	
Voltage Rail*(1)	[3 voltage rail]	
PPR Value	10	
PPR Unit	A	
Camera module name	YHRN	
MIPI port	1	
LaneUsed	[x1]	
PortSpeed	[1]	
MCLK	19200000	
EEPROM Type	[ROM_NONE]	→←: Select Screen
VCM Type	[VCM_NONE]	↑ ↓: Select Item
Number of I2C Components	1	Enter: Select
I2C Channel	[I2C1]	+/-: Change Opt.
Device 0		F1: General Help

Aptio Setup – AMI		
Chipset		
I2C Address	36	F2: Previous Values
Device Type	[Sensor]	F3: Optimized Defaults
Flash Driver Selection	[External]	F4: Save & Exit
Flash Driver Selection*	[Flash1]	ESC: Exit
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* This item appears only when selecting CRD-G2 for CRD Version.
(1) This item appears only when selecting Position 2 for PMIC Position.

Feature	Option	Description
Sensor Model	[IMX135], [OV5693], [IMX179], [OV8858], [OV2740-IVCAM], [OV9728], [IMX188], [IMX208], [OV5670], [OV8865], [HM2051], [OV2742], [OV9234], [OV8856], [OV16860], [IMX362], [OVTID858], [IMX488], [OVTI01AS], [OVTI01A0], [OVTI5678], [OVTI9738], [HIMAX11B1], [LONTIUM], [User Custom]	Control Logic Type
Lanes Clock division	[4 4 2 2], [4 4 3 1], [4 4 4 0], [8 0 2 2], [8 0 3 1], [8 0 4 0]	Lanes Clock division
CRD Version	[PTC], [CRD-G], [Kilshon-PPV], [CRD-D], [CRD-G2]	CRD Version
GPIO control	[No Control Logic], [Control Logic 1], [Control Logic 2], [Control Logic 3], [Control Logic 4]	GPIO control
Camera position	[Front], [Back]	Camera position
Flash Support	[Driver default], [Disabled], [Enabled]	Flash Support
Privacy LED	[Driver default], [ILEDA, 16mA], [ILEDB, 2mA],	Privacy LED

Feature	Option	Description
	[ILEDB, 4mA], [ILEDB, 8mA], [ILEDB, 16mA]	
Rotation	[0], [90], [180], [270]	Rotation
PMIC Position	[Position 1], [Position 2]	OMIC Position Position 1 indicates the current module is placed on the left side of the CRD-G2 card. Position 2 indicates the current module is placed on the right side of the CRD-G2 card.
Voltage Rail	[3 voltage rail], [2 voltage rail]	Voltage Rail
PPR Value	Value input	PPR value of sensor
PPR Unit	Value input	PPR unit of sensor
Camera module name	Name input	Camera module name
MIPI port	Value input	LinkUsed
LaneUsed	[x1], [x2], [x3], [x4], [x8]	LaneUsed
PortSpeed	[0], [1], [2], [3], [4], [5], [6]	PortSpeed: [0]: Sensor default [1]: <416Mbps [2]: <1.5Gbps [3]: <2Gbps [4]: <2.5Gbps [5]: <4Gbps [6]: >4Gbps
MCLK	Value input	MCLK
EEPROM	[ROM_OPT], [ROM_EEPROM_16K_64], [ROM_EEPROM_16K_16], [ROM_OTP_ACPI_ACPI], [ROM_ACPI], [ROM_EEPROM_BRCA016GWZ], [ROM_EEPROM_24AA32], [ROM_EEPROM_M24C64], [ROM_EEPROM_DW9806B], [ROM_EEPROM_CAT24C16], [ROM_EEPROM_CAT24C64], [ROM_EEPROM_24AA16], [ROM_NONE], [ROM_EEPROM_CAT24C08]	EEPROM Type 0x00: ROM_NONE 0x01: ROM_OTP 0x02: ROM_EEPROM_16K_64 0x03: ROM_EEPROM_16K_16 0x04: ROM_OTP_ACPI_ACPI 0x05: ROM_ACPI 0x06: ROM_EEPROM_BRCA016GWZ 0x07: ROM_EEPROM_24AA32 0x08: ROM_EEPROM_CAT24C08 0x09: ROM_M24C64 0x0A: ROM_DW9806B 0x10: ROM_EEPROM_CAT24C16 0x11: ROM_EEPROM_CAT24C64 0x12: ROM_EEPROM_24AA16
VCM Type	[VCM_NONE], [VCM_AD5823], [VCM_AD5816],	VCM Type 0x00: VCM_NONE 0x01: VCM_AD5823

Feature	Option	Description
	[VCM_DW9719], [VCM_DW9718], [VCM_DW9806B], [VCM_WV517S], [VCM_LC898122XA], [VCM_LC898212AXB], [VCM_RESERVED1], [VCM_RESERVED2], [VCM_BU64297GWZ], [VCM_DW9714], [VCM_AK7371]	0x02: VCM_DW9714 0x03: VCM_AD5816 0x04: VCM_DW9719 0x05: VCM_DW9718 0x06: VCM_DW9806B 0x07: VCM_WV517S 0x08: VCM_LC898122XA 0x09: VCM_LC898212AXB 0x0F: VCM_AK7371 0x10: VCM_BU64297GWZ
Number of I2C Components	Value input	Number of I2C Components
I2C Channel	[I2C0], [I2C1], [I2C2], [I2C4], [I2C3], [I2C5], [I2C6], [I2C7]	I2C Channel
I2C Address	Value input	I2C Address
Device Type	[Sensor], [VCM], [EEPROM], [EEPROM_EXT1], [EEPROM_EXT2], [EEPROM_EXT3], [EEPROM_EXT4], [EEPROM_EXT5], [EEPROM_EXT6], [EEPROM_EXT7], [IO Expander], [Flash]	Device Type
Flash Driver Selection	[Disabled], [External], [Internal PMIC]	Select the Flash Driver as External or Internal PMIC
Flash Driver Selection	[Flash1], [Flash2], [Flash3], [Flash4], [Flash5], [Flash6]	Select the Flash Driver as External or Internal PMIC

Figure 157: BIOS Chipset Setup Menu – System Agent (SA) Configuration – MIPI Camera Configuration – Flash options

Aptio Setup – AMI		
Chipset		
Flash1/2		
Flash Model	[External – LM3643]	
Flash Mode	[Xeon Led]	→←: Select Screen
Camera module name	YHRN	↑ ↓: Select Item
I2C Channel	[I2C1]	Enter: Select
I2C Address	63	+/-: Change Opt.
Flash Trigger Gpio		F1: General Help
Group Pad Number	18	F2: Previous Values

Aptio Setup – AMI		
Chipset		
Group Number	[B]	F3: Optimized Defaults
Active Value	1	F4: Save & Exit
Initial Value	0	ESC: Exit
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Feature	Option	Description
Flash Model	[External – LM3643], [PMIC - WRC]	Flash Model
Flash Mode	[Disabled], [White Led], [Warm Led], [IR Led], [Xeon Led]	Select Flash Mode: White LED / Warm LED / IR LED / Xeon LED
Camera module name	Name input	Camera module name
I2C Channel	[I2C0], [I2C1], [I2C2], [I2C3], [I2C4], [I2C5], [I2C6], [I2C7]	I2C Channel
I2C Address	Value input	I2C Address
Group Pad Number	Value input	Group Pad Number
Group Number	[A], [C], [E], [F], [H], [R], [S], [T], [U], [B], [D]	Group Number
Active Value	Value input	Active Value
Initial Value	Value input	Initial Value

Figure 158: BIOS Chipset Setup Menu – PCH-IO Configuration

Aptio Setup – AMI	
Chipset	
PCH-IO Configuration > PCI Express Configuration [1] > SATA Configuration > USB Configuration > Security Configuration > HD Audio Configuration > THC Configuration > SerialIo Configuration > SCS Configuration > ISH Configuration	

Aptio Setup – AMI		
Chipset		
> Pch Thermal Throttling Control		
Skip VCCIN_AUX Configuration	[Disabled]	
> FIVR Configuration		
> PMC Configuration		
> TSN GBE Configuration		
PCH LAN Controller	No GbE Region	
Foxville I225 LAN Controller	[Disabled]	
Foxville I225 Wake on LAN Support (2)	[Disabled]	
Sensor Hub Type	[I2C Sensor Hub]	
DeepSX Power Policies	[Disabled]	
Wale on WLAN and BT Enable	[Disabled]	
DeepSx Wake on WLAN and BT Enable (3)	[Disabled]	
Disable DSX ACPRESENT PullDown	[Disabled]	
Port 80h Redirection	[LPC Bus]	
Enhance Port 80h LPC Decoding (4)	[Enabled]	
Espi CS1 GIR Address	0	
Espi CS1 GMR Address	0	
Compatible Revision ID	[Disabled]	
Legacy IO Low Latency	[Enabled]	
PCH Cross Throttling	[Enabled]	
PCH Energy Reporting	[Enabled]	
LPM S0i2.0	[Disabled]	
LPM S0i3.0	[Disabled]	
C10 Dynamic Threshold adjustment	[Disabled]	
IEH Mode	[Bypass Mode]	
Enable TCO Timer	[Disabled]	
Enable Timed GPIO0	[Disabled]	
Enable Timed GPIO1	[Disabled]	
Pcie Ref Pll SSC	[Auto]	
IOAPIC 24-119 Entries	[Enabled]	
Enable 8254 Clock Gate	[Enabled]	
Lock PCH Sideband Access	[Enabled]	
Flash Protection Range Registers (FPRR)	[Disabled]	
SPD Write Disable	[TRUE]	
LGMR	[Disabled]	→ ←: Select Screen
HOST_C10 reporting to Target	[Disabled]	↑ ↓: Select Item
OS IDLE Mode	[Enabled]	Enter: Select
S0ix Auto Demotion	[Disabled]	+/-: Change Opt.

Aptio Setup – AMI		
Chipset		
Latch Events C10 Exit	[Disabled]	F1: General Help
Hybrid Storage Detection and Configuration Mode	[Disabled]	F2: Previous Values
Cpu Root port used for hybrid storage [5]	255	F3: Optimized Defaults
Extended BIOS Range Decode	[Disabled]	F4: Save & Exit
ACPI L6D PME Handling	[Disabled]	ESC: Exit
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[1] The sub-menu is redirected to CPU – Power Management Control (see Figure 54) when pressing these items.
[2] This item appears only when enabling Foxville I225 LAN Controller.
[3] This item appears only when enabling Wake on WLAN and BT Enable.
[4] This item activates only when selecting LPC Bus for Port 80h Redirection.
[5] This item appears only when selecting Dynamic Configuration for Hybrid Storage Enable for Hybrid Storage Detection and Configuration Mode.

Feature	Option	Description
Skip VCCIN_AUX Configuration	[Disabled], [Enabled]	Skips VCCIN_AUX Configuration if enabled
Foxville I225 LAN Controller	[Enabled], [Disabled]	Enable / Disable Foxville I225 LAN Controller.
Foxville I225 Wake on LAN Support	[Enabled], [Disabled]	Enable / Disable Foxville I225 Wake on LAN Support.
Sensor Hub Type	[None], [I2C Sensor Hub], [USB Sensor Hub]	Choose the Sensor Hub Type. 'None' will suppress 'I2C Sensor Hub' setup option. 'I2C' will suppress 'ALS' setup option. 'USB' will suppress both I2C and ALS.
DeepSx Power Policies	[Disabled], [Enabled in S4-S5-Battery], [Enabled in S5-Battery], [Enabled in S4-S5], [Enabled in S5]	Configure the DeepSx Mode configuration.
Wake on WLAN and BT Enable	[Enabled], [Disabled]	Enable / Disable PCI Express Wireless LAN and Bluetooth to wake the system.
DeepSx Wake on WLAN and BT Enable	[Enabled], [Disabled]	Enable / Disable PCI Express Wireless LAN and Bluetooth to wake the system from DeepSx.
Disable DSX ACPRESENT PullDown	[Enabled], [Disabled]	Disable PCH internal ACPRESENT PullDown when DeepSx or G3 exit.
Port 80h Redirection	[LPC Bus], [PCIE Bus]	Control where the Port 80h cycles are sent.
Enhance Port 80h LPC Decoding	[Disabled], [Enabled]	Support the word / dword decoding of port 80h behind LPC
Espi CS1 GIR Address	Value input	This is to set 16Bit CS1 GIR Address.
Espi CS1 GMR Address	Value input	This is to set 32Bit CS1 GMR Address.

Feature	Option	Description
Compatible Revision ID	[Disabled]	Read only item
Legacy IO Low Latency	[Disabled], [Enabled]	Set to enable low latency of legacy IO. Some systems require low IO latency irrespective of power. This is a tradeoff between power and IO latency.
PCH Cross Throttling	[Disabled], [Enabled]	Enable / Disable the PCH Cross Throttling feature. Only ULT support this feature.
PCH Energy Reporting	[Disabled], [Enabled]	Enable Energy Report. MUST set it as ENABLED. This is only for test purpose.
LPM S0i2.0/3.0	[Disabled], [Enabled]	Enable / Disable S0ix sub-state. This setting is for test purpose. S0ix sub-states should be enabled for production.
C10 Dynamic threshold adjustment	[Disabled], [Enabled]	Enable / Disable C10 dynamic threshold adjustment
IEH Mode	[Bypass Mode], [Enabled]	Enable / Bypass IEH Mode
Enable TCO Timer	[Disabled], [Enabled]	Enable / Disable TCO timer. When disabled, it disables PCH ACPI timer, stops TCO timer, and ACPI WDAT table will not be published.
Enable Timed GPIO0/1	[Disabled], [Enabled]	Enable / Disable Timed GPIO0/1. When disabled, it disables cross time stamp time-synchronization as extension of Hammock Harbor time synchronization.
Pcie Ref Pll SSC	[Auto], [0.0%], [0.1%], [0.2%], [0.3%], [0.4%], [0.5%], [Disabled]	Pcie Ref Pll SSC Percentage. [Auto]: Keep hw default, no BIOS override. Range is 0.0% ~ 0.5%.
IOAPIC 24-119 Entries	[Disabled], [Enabled]	Enables / Disables IOAPIC 24-119 Entries. IRQ24-119 may be used by PCH devices. Disabling those interrupts may cause certain devices failure.
Enable 8254 Clock Gate	[Disabled], [Enabled], [Enabled In Runtime and S3 Resume]	Enables / Disables 8254 clock gate in early phase. Set 8254CGE is necessary for SLP_S0 support. Platform is able disable this policy and set 8254CGE in late phase.
Lock PCH Sideband Access	[Disabled], [Enabled]	Lock PCH Sideband access, include SideBand interface lock and SideBand PortID mask for certain end point (e.g. PSFx). The option is invalid if POSTBOOT SAI is set.
Flash Protection Range Registers (FPRR)	[Disabled], [Enabled]	Enable Flash Protection Range Registers
SPD Write Disable	[TRUE], [FALSE]	Enable / Disable setting SPD Write Disable. For security recommendations, SPD write disable bit must be set.
LGMR	[Enabled], [Disabled]	64KB memory block for LGMR (LPC Memory Range Decode)
HOST_C10 reporting to Target	[Disabled], [Enabled]	This option enables HOST_C10 reporting to Target via eSPI Virtual Wire.

Feature	Option	Description
OS IDLE Mode	[Disabled], [Enabled]	Enable / Disable OS Idle Mode Feature
S0ix Auto Demotion	[Enabled], [Disabled]	Enable / Disable Host Low Power Mode S0ix Auto-Demotion
Latch Events C10 Exit	[Enabled], [Disabled]	Enable / Disable Latch Events on C10 Exit
Hybrid Storage Detection and Configuration Mode	[Dynamic Configuration for Hybrid Storage Enable], [Disabled]	Select Hybrid Storage Detection and Configuration Mode
Cpu Root port used for hybrid storage	Value input	Select cpu root port used for hybrid storage value between 0 to 2
Extended BIOS Range Decode	[Disabled], [Enabled]	Enabling this will make memory cycles falling in a specific area to be redirected to SPI flash controller
ACPI L6D PME Handling	[Enabled], [Disabled]	BIOS through ACPI code can associate specific method to a particular GPE. In this case _L6D for Level-triggered Event, BIOS-ACPI can verify PMEENABLE and PMESTATUS of each device that requires GPE related wake.

Figure 159: BIOS Chipset Setup Menu – PCH-IO Configuration – PCI Express Configuration

Aptio Setup – AMI		
Chipset		
PCI Express Configuration		
DMI Link ASPM Control	[Auto]	
Port8xh Decode	[Disabled]	
Port8xh Decode Port#*	0	
PCIe function swap	[Enabled]	
PCH PCIE Clock Gating	[Disabled]	
PCH PCIE Power Gating	[Disabled]	
> PCIe EQ settings		
PCI Express Root Port 1	Lane configured as USB / SATA / UFS	
PCI Express Root Port 2	Lane configured as USB / SATA / UFS	
> PCI Express Root Port 3		
> PCI Express Root Port 4		
PCI Express Root Port 5	Not present in this SKU	
PCI Express Root Port 6	Not present in this SKU	→←: Select Screen
> PCI Express Root Port 7		↑ ↓: Select Item
PCI Express Root Port 8	Not present in this SKU	Enter: Select
> PCI Express Root Port 9		+/-: Change Opt.
> PCI Express Root Port 10		F1: General Help

Aptio Setup – AMI		
Chipset		
PCI Express Root Port 11	Lane configured as USB / SATA / UFS	F2: Previous Values
PCI Express Root Port 12	Lane configured as USB / SATA / UFS	F3: Optimized Defaults
		F4: Save & Exit
> PCIE clocks		ESC: Exit
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* This item appears only when enabling Port8xh Decode.

Feature	Option	Description
DMI Link ASPM Control	[Disabled], [L0s], [L1], [L0sL1], [Auto]	The control of Active State Power Management of the DMI Link.
Port8xh Decode	[Disabled], [Enabled]	PCI Express Port8xh Decode Enable / Disable.
Port8xh Decode Port#	Value input	Select PCI Express Port8xh Decode Root Port. User to ensure port availability
PCIe function swap	[Disabled], [Enabled]	When Disabled, prevents PCIE rootport function swap. If any function other than 0^{th} is enabled, 0^{th} will become visible.
PCH PCIE Clock Gating	[Disabled], [Enabled]	PCH PCI Express Clock Gating Enable / Disable for all port
PCH PCIE Power Gating	[Disabled], [Enabled]	PCH PCI Express Power Gating Enable / Disable for all port

Figure 160: BIOS Chipset Setup Menu – PCH-IO Configuration – PCI Express Configuration – PCIe EQ settings

Aptio Setup – AMI		
Chipset		
PCIe EQ override	[Disabled]	
PCIe EQ method*	[PCIe hardware EQ]	
PCIe EQ mode*	[Use presets during EQ]	
EQ PH1 downstream port transmitter present*	0	
EQ PH1 upstream port transmitter present*	0	
Enable EQ phase 2 local transmitter override*	[Disabled]	
Number of presents or coefficients used during phase 3*	0	
Preset 0*(1)	0	
Preset 1*(1)	0	
Preset 2*(1)	0	
Preset 3*(1)	0	
Preset 4*(1)	0	
Preset 5*(1)	0	

Aptio Setup – AMI		
Chipset		
Preset 6*(1)	0	
Preset 7*(1)	0	
Preset 8*(1)	0	
Preset 9*(1)	0	
Preset 10*(1)	0	
Pre-cursor coefficient 0*(2)	0	
Post-cursor coefficient 0*(2)	0	
Pre-cursor coefficient 1*(2)	0	
Post-cursor coefficient 1*(2)	0	
Pre-cursor coefficient 2*(2)	0	
Post-cursor coefficient 2*(2)	0	
Pre-cursor coefficient 3*(2)	0	
Post-cursor coefficient 3*(2)	0	
Pre-cursor coefficient 4*(2)	0	
Post-cursor coefficient 4*(2)	0	
Pre-cursor coefficient 5*(2)	0	
Post-cursor coefficient 5*(2)	0	→←: Select Screen
Pre-cursor coefficient 6*(2)	0	↑ ↓ : Select Item
Post-cursor coefficient 6*(2)	0	Enter: Select
Pre-cursor coefficient 7*(2)	0	+/-: Change Opt.
Post-cursor coefficient 7*(2)	0	F1: General Help
Pre-cursor coefficient 8*(2)	0	F2: Previous Values
Post-cursor coefficient 8*(2)	0	F3: Optimized Defaults
Pre-cursor coefficient 9*(2)	0	F4: Save & Exit
Post-cursor coefficient 9*(2)	0	ESC: Exit
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* These items appear only when enabling PCIe EQ override.
(1) These items appear only when selecting Use presets during EQ for PCIe EQ mode.
(2) These items appear only when selecting Use coefficients during EQ for PCIe EQ mode.

Feature	Option	Description
PCIe EQ override	[Disabled], [Enabled]	Choose your own PCIe EQ settings, only for users who have a thorough understanding of equalization process
PCIe EQ method	[PCIe hardware EQ], [PCIe fixed EQ]	Choose PCIe EQ method
PCIe EQ mode	[Use presets during EQ], [Use coefficients during EQ]	Choose EQ mode. Preset mode – root port will use presets during EQ process, Coefficient mode – root port will use coefficients during EQ process
EQ PH1 downstream port transmitter preset	Value input	Choose the value of the preset that will be used during phase 1 of the equalization

Feature	Option	Description
EQ PH1 upstream port transmitter preset	Value input	Choose the value of the preset that will be used during phase 1 of the equalization
Enable EQ phase 2 local transmitter override	[Disabled], [Enabled]	EQ Phase 2 local transmitter override can be used to debug issues with PCI devices equalization.
Number of presets or coefficients used during phase 3	Value input	Select how many presets or coefficients will be used during phase 3 of EQ. Please not that you have to set all of the list entries to valid values. The interpretation of this field depends on PCIe EQ mode
Preset 0..10	Value input	Choose the target preset value
Pre-cursor coefficient 0..9	Value input	Choose the target pre-cursor coefficient value
Post-cursor coefficient 0..9	Value input	Choose the target post-cursor coefficient value

Figure 161: BIOS Chipset Setup Menu – PCH-IO Configuration – PCI Express Configuration – PCI Express Root Port 3 / 4 / 7 / 9 / 10

Aptio Setup – AMI		
Chipset		
PCI Express Root Port 3 / 4 / 7 / 9 / 10	[Enabled]	
Connection Type*	[Slot]	
ASPM*	[Auto]	
L1 Substates*	[L1.1 & L1.2]	
L1 Low*	[Enabled]	
ACS*	[Enabled]	
PTM*	[Enabled]	
DPC*	[Disabled]	
EDPC*	[Enabled]	
URR*	[Disabled]	
FER*	[Disabled]	
NFER*	[Disabled]	
CER*	[Disabled]	
SEFE*	[Disabled]	
SENFE*	[Disabled]	
SECE*	[Disabled]	
PME SCI*	[Enabled]	
Hot Plug*	[Disabled]	
Advanced Error Reporting*	[Enabled]	
PCIe Speed*	[Auto]	
Transmitter Half Swing*	[Disabled]	
Detect Timeout*	0	

Aptio Setup – AMI		
Chipset		
Extra Bus Reserved*	0	
Reserved Memory*	10	
Reserved I/O*	4	
PCH PCIe LTR Configuration*		
LTR*	[Enabled]	
Snoop Latency Override*#	[Auto]	→←: Select Screen
Snoop Latency Value*#(1)	60	↑ ↓: Select Item
Snoop Latency Multiplier*#(1)	[1024 ns]	Enter: Select
Non Snoop Latency Override*#	[Auto]	+/-: Change Opt.
Non Snoop Latency Value*#(2)	60	F1: General Help
Non Snoop Latency Multiplier*#(2)	[1024 ns]	F2: Previous Values
		F3: Optimized Defaults
LTR Lock*	[Disabled]	F4: Save & Exit
Peer Memory Write Enable*	[Disabled]	ESC: Exit
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* These items appear only when enabling PCI Express Root Port 3 / 4 / 7 / 9 / 10.
# These items appear only when enabling LTR.
(1) These items appear only when selecting Manual for Snoop Latency Override.
(2) These items appear only when selecting Manual for Mon Snoop Latency Override.

Feature	Option	Description
PCI Express Root Port 3 / 4 / 7 / 9 / 10	[Disabled], [Enabled]	Control the PCI Express Root Port.
Connection Type	[Bulit-in], [Slot]	[Built-in]: a built-in device is connected to this rootport. SlotImplemented bit will be clear. [Slot]: this rootport connects to user-accessible slot. SlotImplemented bit will be set.
ASPM	[Disabled], [L1], [Auto]	Set the ASPM Level: Force L0s – Force all links to L0s State AUTO – BIOS auto configure DISABLE – Disables ASPM
L1 Substates	[Disabled], [L1.1], [L1.1 & L1.2]	PCI Express L1 Substates settings.
L1 Low	[Disabled], [Enabled]	PCI Express L1 Low Substate Enable / Disable.
ACS	[Disabled], [Enabled]	Enable / Disable Access Control Services Extended Capability
PTM	[Disabled], [Enabled]	Enable / Disable Precision Time Measurement

Feature	Option	Description
DPC	[Disabled], [Enabled]	Enable / Disable Downstream Port Containment
EDPC	[Disabled], [Enabled]	Enable / Disable Rootport extensions for Downstream Port Containment
URR	[Disabled], [Enabled]	PCI Express Unsupported Request Reporting Enable / Disable.
FER	[Disabled], [Enabled]	PCI Express Device Fatal Error Reporting Enable / Disable.
NFER	[Disabled], [Enabled]	PCI Express Device Non-Fatal Error Reporting Enable / Disable.
CER	[Disabled], [Enabled]	PCI Express Device Correctable Error Reporting Enable / Disable.
SEFE	[Disabled], [Enabled]	Root PCI Express System Error on Fatal Error Enable / Disable.
SENFE	[Disabled], [Enabled]	Root PCI Express System Error on Non-Fatal Error Enable / Disable.
SECE	[Disabled], [Enabled]	Root PCI Express System Error on Correctable Error Enable / Disable.
PME SCI	[Disabled], [Enabled]	PCI Express PME SCI Enable / Disable.
Hot Plug	[Disabled], [Enabled]	PCI Express Hot Plug Enable / Disable.
Advanced Error Reporting	[Disabled], [Enabled]	Advanced Error Reporting Enable / Disable.
PCIe Speed	[Auto], [Gen1], [Gen2], [Gen3]	Configure PCIe Speed
Transmitter Half Swing	[Disabled], [Enabled]	Transmitter Half Swing Enable / Disable.
Detect Timeout	Value input	The number of milliseconds reference code will wait for link to exit Detect state for enabled ports before assuming there is no device and potentially disabling the port.
Extra Bus Reserved	Value input	Extra Bus Reserved (0-7) for bridges behind this Root Bridge.
Reserved Memory	Value input	Reserved Memory for this Root Bridge (1-20) MB
Reserved I/O	Value input	Reserved I/O (4K/8K/12K/16K/20K) Range for this Root Bridge.
LTR	[Disabled], [Enabled]	PCH PCIE Latency Reporting Enable / Disable
Snoop Latency Override	[Disabled], [Manual], [Auto]	Snoop Latency Override for PCH PCIE. [Disabled]: Disable override. [Manual]: Manually enter override values. [Auto] (default): Maintain default BIOS flow.
Snoop Latency Value	Value input	LTR Snoop Latency value of PCH PCIE

Feature	Option	Description
Snoop Latency Multiplier	[1 ns], [32 ns], [1024 ns], [32768 ns], [1048576 ns], [33554432 ns]	LTR Snoop Latency Multiplier of PCH PCIE
Non Snoop Latency Override	[Disabled], [Manual], [Auto]	Non Snoop Latency Override for PCH PCIE. [Disabled]: Disable override. [Manual]: Manually enter override values. [Auto] (default): Maintain default BIOS flow.
Non Snoop Latency Value	Value input	LTR Non Snoop Latency value of PCH PCIE
Non Snoop Latency Multiplier	[1 ns], [32 ns], [1024 ns], [32768 ns], [1048576 ns], [33554432 ns]	LTR Non Snoop Latency Multiplier of PCH PCIE
LTR Lock	[Disabled], [Enabled]	PCIE LTR Configuration Lock
Peer Memory Write Enable	[Disabled], [Enabled]	Peer Memory Write Enable / Disable

Figure 162: BIOS Chipset Setup Menu – PCH-IO Configuration – PCI Express Configuration – PCIE clocks

Aptio Setup – AMI		
Chipset		
Clock0 assignment	[Platform-POR]	
ClkReq for Clock0	[Platform-POR]	
Clock1 assignment	[Platform-POR]	
ClkReq for Clock1	[Platform-POR]	
Clock2 assignment	[Platform-POR]	
ClkReq for Clock2	[Platform-POR]	
Clock3 assignment	[Platform-POR]	
ClkReq for Clock3	[Platform-POR]	
Clock4 assignment	[Platform-POR]	
ClkReq for Clock4	[Platform-POR]	
Clock5 assignment	[Platform-POR]	
ClkReq for Clock5	[Platform-POR]	→←: Select Screen
Clock6 assignment	[Platform-POR]	↑ ↓: Select Item
ClkReq for Clock6	[Platform-POR]	Enter: Select
Clock7 assignment	[Platform-POR]	+/-: Change Opt.
ClkReq for Clock7	[Platform-POR]	F1: General Help

Aptio Setup – AMI		
Chipset		
Clock8 assignment	[Platform-POR]	F2: Previous Values
ClkReq for Clock8	[Platform-POR]	F3: Optimized Defaults
Clock9 assignment	[Platform-POR]	F4: Save & Exit
ClkReq for Clock9	[Platform-POR]	ESC: Exit
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Feature	Option	Description
Clock0..9 assignment	[Platform-POR], [Enabled], [Disabled]	[Platform-POR]: clock is assigned to PCIe port or LAN according to board layout. [Enabled]: keep clock enabled even if unused. [Disabled]: Disable clock.
ClkReq for Clock0..9	[Platform-POR], [Disabled]	[Platform-POR]: CLKREQ signal is assigned to CLKSRC according to board layout. [Disabled]: CLKREQ will not be used.

Figure 163: BIOS Chipset Setup Menu – PCH-IO Configuration – SATA Configuration

Aptio Setup – AMI		
Chipset		
SATA Configuration		
SATA Controller(s)	[Enabled]	
SATA Mode Selection*	[AHCI]	
SATA Test Mode*	[Disabled]	
Aggressive LPM Support*(1)	[Enabled]	
Serial ATA Port 0*	Empty	
Software Preserve*	Unknown	
Port 0*	[Enabled]	
Hot Plug*	[Disabled]	
Configured as eSATA*(3)	Hot Plug supported	
External*	[Disabled]	
Mechanical Presence Switch*(2)	[Disabled]	
Spin Up Device*	[Disabled]	
SATA Device Type*	[Hard Disk Drive]	
Topology*	[Unknown]	
SATA Port 0 DevSlp*	[Disabled]	
DITO Configuration*	[Disabled]	
DITO Value*(4)	625	
DM Value*(4)	15	
Serial ATA Port 1*	Empty	

Aptio Setup – AMI		
Chipset		
Software Preserve*	Unknown	
Port 1*	[Enabled]	
Hot Plug*	[Disabled]	
Configured as eSATA*(3)	Hot Plug supported	
External*	[Disabled]	
Mechanical Presence Switch*(2)	[Disabled]	
Spin Up Device*	[Disabled]	
SATA Device Type*	[Hard Disk Drive]	
Topology*	[Unknown]	
SATA Port 1 DevSlp*	[Disabled]	
DITO Configuration*	[Disabled]	
DITO Value*(4)	625	
DM Value*(4)	15	
Serial ATA Port 2*	Empty	
Software Preserve*	Unknown	
Port 2*	[Enabled]	
Hot Plug*	[Disabled]	
Configured as eSATA*(3)	Hot Plug supported	
External*	[Disabled]	→ ←: Select Screen
Mechanical Presence Switch*(2)	[Disabled]	↑ ↓: Select Item
Spin Up Device*	[Disabled]	Enter: Select
SATA Device Type*	[Hard Disk Drive]	+/-: Change Opt.
Topology*	[Unknown]	F1: General Help
SATA Port 2 DevSlp*	[Disabled]	F2: Previous Values
DITO Configuration*	[Disabled]	F3: Optimized Defaults
DITO Value*(4)	625	F4: Save & Exit
DM Value*(4)	15	ESC: Exit
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* These items appear only when enabling SATA Controller(s).
(1) This item appears only when disabling SATA Test Mode.
(2) This item appears only when enabling Hot Plug.
(3) This item appears only when disabling External.
(4) These items appear only when enabling DITO Configuration.

Feature	Option	Description
SATA Controller(s)	[Enabled], [Disabled]	Enable / Disable SATA Device.
SATA Mode Selection	[AHCI]	Read only item
SATA Test Mode	[Enabled], [Disabled]	Test Mode Enable / Disable (Loop Back).
Aggressive LPM Support	[Disabled], [Enabled]	Enable PCH to aggressively enter link power state.

Feature	Option	Description
Port 0..2	[Disabled], [Enabled]	Enable or Disable SATA Port
Hot Plug	[Disabled], [Enabled]	Designates this port as Hot Pluggable.
External	[Disabled], [Enabled]	Marks this port as external.
Mechanical Presence Switch	[Disabled], [Enabled]	Controls reporting if this port has an Mechanical Presence Switch. Note: Requires hardware support.
Spin Up Device	[Disabled], [Enabled]	If enabled for any of ports Staggerred Spin Up will be performed and only the drives which have this option enabled will spin up at boot. Otherwise all drives spin up at boot.
SATA Device Type	[Hard Disk Drive], [Solid State Drive]	Identify the SATA port is connected to Solid State Drive or Hard Disk Drive
Topology	[Unknown], [ISATA], [Direct Connect], [Flex], [M2]	Identify the SATA Topology if it is Default or ISATA or Flex or DirectConnect or M2
SATA Port 0..2 DevSlp	[Disabled], [Enabled]	Enable / Disable SATA Port 0..2 DevSlp. For DevSlp to work, both hard drive and SATA port need to support DevSlp function, otherwise an unexpected behavior might happen. Please check board design before enabling it.
DITO Configuration	[Disabled], [Enabled]	Enable / Disable DITO Configuration
DITO Value	Value input	DITO Value
DM Value	Value input	DM Value

Figure 164: BIOS Chipset Setup Menu – PCH-IO Configuration – USB Configuration

Aptio Setup – AMI		
Chipset		
USB Configuration		
xDCI Support	[Disabled]	
USB2 PHY Sus Well Power Gating	[Enabled]	
USB PDO Programming	[Enabled]	
USB Overcurrent	[Enabled]	
USB Overcurrent Lock	[Enabled]	
USB Audio Offload	[Enabled]	
Enable HSII on xHCI	[Enabled]	

Aptio Setup – AMI		
Chipset		
USB3.1 Portx Speed Selection	0	
USB Port Disable Override	[Disabled]	
USB SW Device Mode Port #0*	[Disabled]	
USB SW Device Mode Port #1*	[Disabled]	
USB SW Device Mode Port #2*	[Disabled]	
USB SW Device Mode Port #3*	[Disabled]	
USB SW Device Mode Port #4*	[Disabled]	
USB SW Device Mode Port #5*	[Disabled]	
USB SW Device Mode Port #6*	[Disabled]	
USB SW Device Mode Port #7*	[Disabled]	
USB SW Device Mode Port #8*	[Disabled]	
USB SW Device Mode Port #9*	[Disabled]	
USB SS Physical Connector #0*	[Enabled]	
USB SS Physical Connector #1*	[Enabled]	
USB SS Physical Connector #2*	[Enabled]	
USB SS Physical Connector #3*	[Enabled]	
USB HS Physical Connector #0*	[Enabled]	
USB HS Physical Connector #1*	[Enabled]	→ ←: Select Screen
USB HS Physical Connector #2*	[Enabled]	↑ ↓: Select Item
USB HS Physical Connector #3*	[Enabled]	Enter: Select
USB HS Physical Connector #4*	[Enabled]	+/-: Change Opt.
USB HS Physical Connector #5*	[Enabled]	F1: General Help
USB HS Physical Connector #6*	[Enabled]	F2: Previous Values
USB HS Physical Connector #7*	[Enabled]	F3: Optimized Defaults
USB HS Physical Connector #8*	[Disabled]	F4: Save & Exit
USB HS Physical Connector #9*	[Enabled]	ESC: Exit
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* These items appear only when selecting Select Per-Pin for USB Port Disable Override.

Feature	Option	Description
xDCI	[Disabled], [Enabled]	Enable / Disable xDCI (USB OTG Device).
USB2 PHY Sus Well Power Gating	[Disabled], [Enabled]	Select 'Enabled' to enable SUS Well PG for USB2 PHY. This option has no effect on PCH-H.
USB PDO Programming	[Disabled], [Enabled]	Select 'Enabled' if Port Disable Override functionality is used.
USB Overcurrent	[Disabled], [Enabled]	Select 'Disabled' for pin-based debug. If pin-based debug is enabled but USB overcurrent is not disabled, USB DbC does not work.

Feature	Option	Description
USB Overcurrent Lock	[Disabled], [Enabled]	Select 'Disabled' if Overcurrent functionality is used. Enabling this will make xHCI controller consume the Overcurrent mapping data
USB Audio Offload	[Disabled], [Enabled]	Enable / Disable USB Audio Offload functionality
Enable HSII on xHCI	[Disabled], [Enabled]	Enable / Disable HSII feature. It may lead to increased power consumption.
USB3.1 Portx Speed Selection	Value input	Port Selection value in decimal for Gen1; Default – Gen2; Bit 0 corresponds to Port 0 and so on.
USB Port Disable Override	[Disabled], [Select Per-Pin]	Selectively Enable / Disable the corresponding USB port from reporting a Device Connection to the controller.
USB SW Device Mode Port #0..9	[Disabled], [Enabled]	Enable Connector Event for device subscription.
USB SS Physical Connector #0..3	[Disabled], [Enabled]	Enable / Disable this USB Physical Connector (physical port). Once disabled, any USB devices plug into the connector will not be detected by BIOS or OS.
USB HS Physical Connector #0..9	[Disabled], [Enabled]	Enable / Disable this USB Physical Connector (physical port). Once disabled, any USB devices plug into the connector will not be detected by BIOS or OS.

Figure 165: BIOS Chipset Setup Menu – PCH-IO Configuration – Security Configuration

Aptio Setup – AMI		
Chipset		
Security Configuration		
RTC Memory Lock	[Enabled]	→←: Select Screen
BIOS Lock	[Enabled]	↑ ↓: Select Item
Force unlock on all GPIO pads	[Enabled]	Enter: Select
		+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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Feature	Option	Description
RTC Memory Lock	[Disabled], [Enabled]	Enable will lock bytes 38h-3Fh in the lower / upper 128-byte bank of RTC RAM
BIOS Lock	[Disabled], [Enabled]	Enable / Disable the PCH BIOS Lock Enable feature. Required to be enabled to ensure SMM protection of flash.

Feature	Option	Description
Force unlock on all GPIO pads	[Disabled], [Enabled]	If Enabled BIOS will force all GPIO pads to be in unlocked state

Figure 166: BIOS Chipset Setup Menu – PCH-IO Configuration – HD Audio Configuration

Aptio Setup – AMI		
Chipset		
HD Audio Subsystem Configuration Settings		
Audio DSP	[Disabled]	
Audio DSP Compliance Mode*	[Non-UAA (IntelSST)]	
HDA Link	[Enabled]	
DMIC #0	[Disabled]	
DMIC #1	[Disabled]	
SSP #0	[Disabled]	
SSP #1	[Disabled]	
SSP #2	[Disabled]	
SSP #3	[Disabled]	
SSP #4	[Disabled]	
SSP #5	[Disabled]	
SNDW #0	[Disabled]	→←: Select Screen
SNDW #1	[Disabled]	↑ ↓: Select Item
SNDW #2	[Disabled]	Enter: Select
SNDW #3	[Disabled]	+/-: Change Opt.
> HD Audio Advanced Configuration		F1: General Help
> HD Audio DSP Features Configuration*		F2: Previous Values
HD Audio Bus Controller Subsystem Id	[72708086]	F3: Optimized Defaults
Virtual Channel Type	[VC0]	F4: Save & Exit
HDA Codec ALC245 Configuration	[No Dmic to codec]	ESC: Exit
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* These items appear only when enabling Audio DSP.

Feature	Option	Description
Audio DSP	[Disabled], [Enabled]	Enable / Disable Audio DSP.
Audio DSP Compliance Mode	[Non-UAA (IntelSST)], [UAA (HDA Inbox/IntelSST)]	Specifies DSP enabled system compliance: 1. Non-UAA (IntelSST driver support only – CC_040100) 2. UAA (HD Audio Inbox or IntelSST driver support – CC_040380) Note: NHLT (DMIC/BT/I2S configuration) is published for non-UAA only.

Feature	Option	Description
HDA Link DMIC #0/1 SSP #0..5 SNDW #0..3	[Disabled], [Enabled]	Muxed interfaces: 1) HDA/SSP0 2) HDA[SDI1]/SSP1 3) DMIC0/SNDW4 4) DMIC1/SNDW3 CNL only: 5) HDA/SNDW1 6) SSP1/SNDW2
HD Audio Bus Controller Subsystem Id	[72708086], [300010EC], [300210EC], [300410EC], [300610EC], [300810EC], [300A10EC], [300C10EC], [300E10EC], [301010EC], [301210EC], [301610EC], [301810EC], [301A10EC], [301C10EC], [301E10EC], [302010EC], [302210EC], [302410EC], [302610EC], [302810EC], [302A10EC], [302C10EC], [302E10EC], [303010EC], [304210EC], [304A10EC], [305410EC], [305610EC], [0A321028]	Select HA Audio Bus Controller Subsystem Id
Virtual Channel Type	[VC0], [VC1]	Enable / Disable HD Audio to use VC0 / VC1. Default is VC0.
HDA Codec ALC245 Configuration	[No Dmic to codec], [4 Dmic to codec], [2 Dmic to codec]	Option for configuring DMIC connection to ALC245.

Figure 167: BIOS Chipset Setup Menu – PCH-IO Configuration – HD Audio Configuration – HD Audio Advanced Configuration

Aptio Setup – AMI		
Chipset		
HD Audio Subsystem Advanced Configuration Settings		
iDisplay Audio Disconnect	[Disabled]	
Codec Sx Wake Capability	[Disabled]	
PME Enable	[Disabled]	
Statically Switchable BCLK Clock Frequency Configuration:		
HD Audio Link Frequency	[24 MHz]	
iDisplay Audio Link Frequency	[96 MHz]	
iDisplay Audio Link T-Mode	[8T Mode]	
Autonomous Clock Stop SNDW #0	[Disabled]	
Autonomous Clock Stop SNDW #1	[Disabled]	
Autonomous Clock Stop SNDW #2	[Disabled]	
Autonomous Clock Stop SNDW #3	[Disabled]	→←: Select Screen
Data On Active Interval Select SNDW #0	[11 clock periods]	↑ ↓: Select Item
Data On Active Interval Select SNDW #1	[11 clock periods]	Enter: Select
Data On Active Interval Select SNDW #2	[11 clock periods]	+/-: Change Opt.
Data On Active Interval Select SNDW #3	[11 clock periods]	F1: General Help
Data On Delay Select SNDW #0	[3 clock periods]	F2: Previous Values
Data On Delay Select SNDW #1	[3 clock periods]	F3: Optimized Defaults
Data On Delay Select SNDW #2	[3 clock periods]	F4: Save & Exit
Data On Delay Select SNDW #3	[3 clock periods]	ESC: Exit
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Feature	Option	Description
iDisplay Audio Disconnect	[Disabled], [Enabled]	Disconnects SDI2 signal to hide / disable iDisplay Audio Codec.
Codec Sx Wake Capability	[Disabled], [Enabled]	Capability to detect wake initiated by a codec in Sx (eg by modem codec)
PME Enable	[Disabled], [Enabled]	Enables PME wake of HD Audio controller during POST.
HD Audio Link Frequency	[6 MHz], [12 MHz], [24 MHz]	Selects HD Audio Link frequency. Applicable only if HDA codec supports selected frequency.
iDisplay Audio Link Frequency	[48 MHz], [96 MHz]	Selects iDisplay Link frequency.

Feature	Option	Description
iDisplay Audio Link T-Mode	[1T Mode], [2T Mode], [4T Mode], [8T Mode], [16T Mode]	Indicates whether SDI is operating in 1T, 2T (CNL) or 2T, 4T, 8T mode (ICL).
Autonomous Clock Stop SNDW #0..3	[Disabled], [Enabled]	Enable / Disable Autonomous Clock Stop for SoundWire LINK0..3
Data On Active Interval Select SNDW #0..3	[6 clock periods], [7 clock periods], [8 clock periods], [11 clock periods]	Data On Active Interval Select: 1) 6 clock periods 2) 7 clock periods 3) 8 clock periods 4) 11 clock periods
Data On Delay Select SNDW #0..3	[2 clock periods], [3 clock periods]	Data On Delay Select: 1) 2 clock periods 2) 3 clock periods

Figure 168: BIOS Chipset Setup Menu – PCH-IO Configuration – HD Audio Configuration – HD Audio DSP Features Configuration

Aptio Setup – AMI	
Chipset	
HD Audio Subsystem Features Configuration (ACPI)	
Audio DSP NHLT Endpoints Configuration:	
Dmic Mono 38.4MHz [Disabled]	
Dmic Stereo 38.4MHz [Disabled]	
Dmic Quad 38.4MHz [Disabled]	
Dmic Mono 24MHz [Disabled]	
Dmic Stereo 24MHz [Disabled]	
Dmic Quad 24MHz [Disabled]	
Bluetooth 38.4MHz [Enabled]	
Bluetooth 24MHz [Disabled]	
I2S Alc274 38.4MHz [Disabled]	
I2S Alc274 24MHz [Disabled]	
LONTIUMI2S0 [Disabled]	
LONTIUMI2S2 [Disabled]	
EVEREST8316 [Disabled]	
I2S Codec Select [Disabled]	
I2S Codec Bus Number [I2C0 Controller]	
Audio DSP Feature Support:	
WoV (Wake on Voice) [Enabled]	

Aptio Setup – AMI		
Chipset		
Bluetooth Sideband	[Enabled]	
BT Intel HFP	[Enabled]	
BT Intel A2DP	[Enabled]	
BT Intel Low Energy	[Disabled]	
Codec based VAD	[Disabled]	
DSP based Speech Pre-Processing Disabled	[Disabled]	
Voice Activity Detection	[Windows 10 Voice Activation]	
Audio DSP Pre/Post-Processing Module Support:		
Waves Post-process	[Disabled]	
DTS	[Disabled]	
IntelSST Speech	[Disabled]	
Dolby	[Disabled]	
Waves Pre-process	[Disabled]	
Audyssey	[Disabled]	
Maxim Smart AMP	[Disabled]	
ForteMedia SAMSoft	[Disabled]	
Sound Research IP	[Disabled]	
Conexant Pre-Process	[Disabled]	
Conexant Smart Amp	[Disabled]	
Realtek Post-Process	[Disabled]	
Realtek Smart Amp	[Disabled]	
Icepower IP MFX sub module	[Disabled]	
Icepower IP EFX sub module	[Disabled]	
Icepower IP SFX sub module	[Disabled]	→←: Select Screen
Voice Preprocessing	[Disabled]	↑ ↓: Select Item
Acoustic Context Awareness (ACA)	[Disabled]	Enter: Select
Custom Module 'Alpha'	[Disabled]	+/-: Change Opt.
'Alpha' GUID: (1)		F1: General Help
Custom Module 'Beta'	[Disabled]	F2: Previous Values
'Beta' GUID: (2)		F3: Optimized Defaults
Custom Module 'Gamma'	[Disabled]	F4: Save & Exit
'Gamma' GUID: (3)		ESC: Exit
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(1) This item appears only when enabling Custom Module 'Alpha'.
(2) This item appears only when enabling Custom Module 'Beta'.
(3) This item appears only when enabling Custom Module 'Gamma'.

Feature	Option	Description
WoV (Wake on Voice)	[Disabled], [Enabled]	Enables / Disables DSP Feature. Bitmask structure: [BIT0] – WoV [BIT1] – BT Sideband [BIT2] – Codec based VAD [BIT5] – BT Intel HFP [BIT6] – BT Intel A2DP [BIT7] – DSP based speech pre-processing disabled (for Intel WoV mode) [BIT8] – WoV Mode: Intel WoV / Windows Voice Activation for Cortana
Bluetooth Sideband		
BT Intel HFP		
BT Intel A2DP		
BT Intel Low Energy		
Codec based VAD		
Voice Activity Detection	[Intel Wake on Voice], [Windows 10 Voice Activation]	
DSP based Speech Pre-Processing Disabled	[Disabled]	Read only item
Waves Post-process	[Disabled], [Enabled]	Enables / Disables 3rd Party Processing Module Support (identified by GUID). WoV must be enabled as a feature first to select relevant WoV IP.
DTS		
IntelSST Speech		
Dolby		
Waves Pre-process		
Audyssey		
Maxim Smart AMP		
ForteMedia SAMSoft		
Sound Research IP		
Conexant Pre-Process		
Conexant Smart Amp		
Realtek Post-Process		
Realtek Smart Amp		
Icepower IP MFX sub module		
Icepower IP EFX sub module		
Icepower IP SFX sub module		
Voice Preprocessing		
Acoustic Context Awareness (ACA)		
Custom Module ‘Alpha’		
Custom Module ‘Beta’		
Custom Module ‘Gamma’		
‘Alpha’ GUID	Digit character input	Input hex digit character in aabbccdd-eeff-gghh-iijj-kkllmmnnoopp format.
‘Beta’ GUID		
‘Gamma’ GUID		

Figure 169: BIOS Chipset Setup Menu – PCH-IO Configuration – THC Configuration

Aptio Setup – AMI		
Chipset		
Touch Host Controller Configuration		
THC Port Configuration	[None]	
Port Clock*	[Functional]	
Active LTR*	FFFFFFFF	
Idle LTR*	FFFFFFFF	
HID Over SPI Limit Packet Size*	0	
Hid Over Spi Performance Limitation*	0	
Wake On Touch*	[Disabled]	
THC Mode*	[HID over SPI]	
Connection Speed*	17000000	
Flags*	[Single SPI Mode]	
Input Report Body Address*	0	
Input Report Header Address*	0	
Output Report Address*	0	
Write Opcode*	0	
Read Opcode*	0	
Reset Pad Trigger*	[Low]	
THC Port Configuration	[None]	
Port Clock*	[Functional]	
Active LTR*	FFFFFFFF	
Idle LTR*	FFFFFFFF	
HID Over SPI Limit Packet Size*	0	
Hid Over Spi Performance Limitation*	0	
Wake On Touch*	[Disabled]	
THC Mode*	[HID over SPI]	→←: Select Screen
Connection Speed*	17000000	↑ ↓: Select Item
Flags*	[Single SPI Mode]	Enter: Select
Input Report Body Address*	0	+/-: Change Opt.
Input Report Header Address*	0	F1: General Help
Output Report Address*	0	F2: Previous Values
Write Opcode*	0	F3: Optimized Defaults
Read Opcode*	0	F4: Save & Exit
Reset Pad Trigger*	[Low]	ESC: Exit
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* These items appear only when selecting THC0 / THC1 for THC Port Configuration.

Feature	Option	Description
THC Port Configuration	[None], [THC0 / THC1]	Assign Port to THC
Port Clock	[Functional], [DFX]	SPI_DFX_CLK_EN BIT set to 0 or 1
Active LTR	Value input	Expose Active LTR data through ACPI _DSM for OS driver to configure
Idle LTR	Value input	Expose Idle LTR data through ACPI _DSM for OS driver to configure
HID Over SPI Limit Packet Size	Value input	When set, limits SPI read & write packet size to 64B. Otherwise, THC uses Max Soc packet size for SPI Read and Write 0 – Max Soc Packet Size 1 – 64 Bytes
Hid Over Spi Performance Limitation	Value input	Minimum amount of delay the driver must wait between end of write operation and begin pf read operation. This value shall be in 10us multiples 0 – Disabled 1 – 65535 (0xFFFF) up to 655350us
Wake On Touch	[Disabled], [Enabled]	Based on this setting vGPIO for given THC will be in native mode, and additional _CRS foe wake will be exposed in ACPI.
THC Mode	[HID over SPI]	Read only item
Connection Speed	Value input	HID Over SPI Connection Speed in Hz
Flags	[Single SPI Mode], [Dual SPI Mode], [Quad SPI Mode]	HID Over SPI Flags
Input Report Body Address	Value input	HID Over SPI Input Report Body Address
Input Report Header Address	Value input	HID Over SPI Input Report Header Address
Output Report Address	Value Input	HID Over SPI Output Report Address
Write Opcode	Value input	HID Over SPI Write Opcode
Read Opcode	Value input	HID Over SPI Read Opcode
Reset Pad Trigger	[Low], [High]	HID Over SPI Reset Pad Trigger

Figure 170: BIOS Chipset Setup Menu – PCH-IO Configuration – SerialIO Configuration

Aptio Setup – AMI		
Chipset		
SerialIO Configuration		
I2C0 Controller	[Disabled]	
I2C1 Controller (1)	[Disabled]	
I2C2 Controller (1)	[Disabled]	
I2C3 Controller (1)	[Disabled]	
I2C4 Controller	[Disabled]	
I2C5 Controller	[Disabled]	
I2C6 Controller	[Disabled]	
I2C7 Controller	[Disabled]	
SPI0 Controller	[Disabled]	
SPI1 Controller	[Enabled]	
SPI2 Controller	[Disabled]	
SPI3 Controller	[Disabled]	
SPI4 Controller	[Disabled]	
SPI5 Controller	[Disabled]	
SPI6 Controller	[Disabled]	
UART0 Controller	[Enabled]	
UART1 Controller	[Disabled]	
UART2 Controller	[Disabled]	
UART3 Controller	[Disabled]	
UART4 Controller	[Disabled]	
UART5 Controller	[Disabled]	
UART6 Controller	[Disabled]	
GPIO IRQ Route	[IRQ14]	
> Serial IO I2C0 Settings (2)		
> Serial IO I2C1 Setting (2)		
> Serial IO I2C2 Setting (2)		
> Serial IO I2C3 Setting (2)		
> Serial IO I2C4 Settings (2)		
> Serial IO I2C5 Settings (2)		
> Serial IO I2C6 Settings (2)		
> Serial IO I2C7 Settings (2)		
> Serial IO SPI0 Settings (3)		
> Serial IO SPI1 Settings (3)		
> Serial IO SPI2 Settings (3)		
> Serial IO UART0 Settings (4)		
> Serial IO UART1 Settings (4)		

Aptio Setup – AMI		
Chipset		
WITT/MITT I2C Test Device	[Disabled]	
WITT/MITT Device selection (5)	[MITT]	
I2C0 (5)	[Disabled]	
I2C1 (5)	[Disabled]	
I2C2 (5)	[Disabled]	
I2C4 (5)	[Disabled]	
I2C4 (5)	[Disabled]	→←: Select Screen
I2C5 (5)	[Disabled]	↑ ↓: Select Item
WITT/MITT SPI Test Device	[Disabled]	Enter: Select
SPI0 (6)	[Disabled]	+/-: Change Opt.
SPI1 (6)	[Disabled]	F1: General Help
SPI2 (6)	[Disabled]	F2: Previous Values
UART Test Device	[Disabled]	F3: Optimized Defaults
Additional Serial IO devices	[Disabled]	F4: Save & Exit
SerialIO Timing parameters	[Disabled]	ESC: Exit
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(1) These items activate only when enabling I2C0 Controller.
(2) These items appear only when enabling I2C0/4/5/6/7 Controllers respectively.
(3) These items appear only when enabling SPI0/1/2 Controllers respectively.
(4) These items appear only when enabling UART0/1 Controllers respectively.
(5) These items appear only when enabling WITT/MITT I2C Test Device.
(6) These items appear only when enabling WITT/MITT SPI Test Device.

Feature	Option	Description
I2C0/1/2/3/6/7 Controller	[Disabled], [Enabled]	Enables / Disables SerialIo Controller If given device is Function 0 PSF disabling is skipped. PSF default will remain and device PCI CFG Space will still be visible. This is needed to allow PCI enumerator access functions above 0 in a multifunction device. The following devices depend on each other: I2C0 and I2C1, 2, 3 UART0 and UART1, SPI0, 1 UART2 and I2C4, 5 UART 0 (00:30:00) cannot disabled when: 1. Child device is enabled like CNVi Bluetooth (_SB.PC00>UA00>BTH0) UART 0 (00:30:00) cannot be enabled when: 1. I2S Audio codec is enabled (_SB.PC00.I2C0>HDAC)
SPI0/1/3/4/5/6 Controller		
UART1/3/4/5/6 Controller		
I2C4 Controller	[Disabled], [Enabled]	Enables / Disables SerialIo Controller For I2C5 and UART2 to work, this device has to be enabled.

Feature	Option	Description
I2C5 Controller	[Disabled], [Enabled], [Post Code Only]	Enables / Disables SerialIo Controller For This device to work, I2C4 has to be enabled.
SPI2 Controller	[Disabled], [Enabled]	Enables / Disables SerialIo SPI2 Controller The following device depends from: Thermal Subsystem in PCI mode Otherwise SPI2 will not appear in this OS
UART0 Controller	[Disabled], [Enabled], [Communication port (COM)]	Set UART0 mode - DBG used for BIOS log print and / or Kernel OS Debug - COM – 16550 compatible serial port with Power Gating support
UART2 Controller	[Disabled]	Read only item
GPIO IRQ Route	[IRQ14], [IRQ15]	Route all GPIOs to one of the IRQ.
WITT/MITT I2C Test Device	[Disabled], [Enabled]	Enable SIO I2C WITT Device and select which are all controller used it
WITT/MITT Device selection	[WITT], [MITT]	Change WITT Device version
I2C0/1/2/4/5	[Disabled], [Enabled]	Enable SIO I2C WITT Device and select which are all controller used it
WITT/MITT SPI Test Device	[Disabled], [Enabled]	Enable SIO SPI WITT Device and select which are all controller used it
SPI0/1/2	[Disabled], [Enabled]	Enable SIO SPI WITT Device and select which are all controller used it
UART Test Device	[Disabled], [Enabled – UART0], [Enabled – UART1], [Enabled – UART2]	Choose if UART Test Device is used and with which controller
Additional Serial IO devices	[Disabled], [Enabled]	When enabled, ACPI will report additional devices connected to Serial IO.
SerialIO Timing parameters	[Disabled], [Enabled]	Enables additional timing parameters for all SerialIO controllers. Defaults can be changed in each controller setting. Platform restart required to apply changes.

Figure 171: BIOS Chipset Setup Menu – PCH-IO Configuration – SerialIO Configuration – Serial IO I2C0 Settings

Aptio Setup – AMI	
Chipset	
Serial IO I2C0 Settings	
> Serial IO Touch Pad Settings	→←: Select Screen
> Serial IO Touch Panel Settings	↑ ↓: Select Item
	Enter: Select
Timing parameters disabled	+/-: Change Opt.
	F1: General Help
	F2: Previous Values
	F3: Optimized Defaults
	F4: Save & Exit
	ESC: Exit
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Figure 172: BIOS Chipset Setup Menu – PCH-IO Configuration – SerialIO Configuration – Serial IO I2C0 Settings – Serial IO Touch Pad Settings

Aptio Setup – AMI		
Chipset		
Touch Pad	[Disabled]	
Touch Pad Interrupt Mode*	[APIC Interrupt]	
Device's bus address*(1)	0	→←: Select Screen
Device's HID address*(1)	0	↑ ↓: Select Item
Device's bus speed*(1)	[100kHz]	Enter: Select
		+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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* These items appear only when enabling Touch Pad.
(1) These items appear only when selecting Custom device for Touch Pad.

Feature	Option	Description
Touch Pad	[Disabled], [Synaptics Precision Touchpad], [Synaptics Forcepad], [ALPS Precision Touchpad ClickPad], [THAT Touchpad], [Sensel Forcepad],	Indicates what type of I2C Touch Pad is connected to this Seriallo controller

Feature	Option	Description
	[Smart C Cover], [Custom device]	
Touch Pad Interrupt Mode	[GPIO Interrupt], [APIC Interrupt]	Select different routing for interrupts from Touch Pad
Device's bus address	Value input	Specify parameters of custom I2C device
Device's HID address	Value input	Specify parameters of custom I2C device
Device's bus speed	[100kHz], [400kHz], [1MHz]	Specify parameters of custom I2C device

Figure 173: BIOS Chipset Setup Menu – PCH-IO Configuration – SerialIO Configuration – Serial IO I2C0 Settings – Serial IO Touch Panel Settings

Aptio Setup – AMI		
Chipset		
Touch Panel	[Disabled]	
Touch Panel Interrupt Mode*	[APIC Interrupt]	
Device's bus address*(1)	0	→←: Select Screen
Device's HID address*(1)	0	↑ ↓: Select Item
Device's bus speed*(1)(2)	[400kHz]	Enter: Select
		+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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* These items appear only when enabling Touch Panel.
(1) These items appear when selecting Custom device for Touch Panel.
(2) This item appears when selecting WACOM TouchPanel for Touch Panel.

Feature	Option	Description
Touch Panel	[Disabled], [Atme13432 TouchPanel], [Atme12952 TouchPanel], [Elan9048 TouchPanel], N-Trig/Samsung 13.3"], [N-Trig/Sharp 12.5"], [WACOM TouchPanel], [Custom device]	Indicates what type of I2C Touch Panel is connected to this Seriallo controller

Feature	Option	Description
Touch Panel Interrupt Mode	[GPIO Interrupt], [APIC Interrupt]	Select different routing for interrupts from Touch Panel
Device's bus address	Value input	Specify parameters of custom I2C device
Device's HID address	Value input	Specify parameters of custom I2C device
Device's bus speed	[100kHz], [400kHz], [1MHz]	Specify parameters of custom I2C device

Figure 174: BIOS Chipset Setup Menu – PCH-IO Configuration – SerialIO Configuration – Serial IO I2C1/2/3/4/5/6/7 Settings

Aptio Setup – AMI	
Chipset	
Serial IO I2C1/2/3/4/5/6/7 Settings	
Timing parameters disabled	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Read only.

Figure 175: BIOS Chipset Setup Menu – PCH-IO Configuration – SerialIO Configuration – Serial IO SPI0/1/2 Settings

Aptio Setup – AMI		
Chipset		
Serial IO SPI0/1/2 Settings		
ChipSelect 0 polarity	[Active High]	
Delayed Rx Clock SPI0	[0]	→←: Select Screen
ChipSelect 1 polarity	[Active High]	↑ ↓: Select Item
		Enter: Select
Timing parameters disabled		+/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Feature	Option	Description
ChipSelect 0/1 polarity	[Active Low], [Active High]	Sets initial polarity for ChipSelect signal. Active low is with initial idle polarity of low and vice versa
Delayed Rx Clock SPI0/1/2	[0], [1], [2], [3]	Configure the SPI Delayed Rx Clock option: Default: 0 [DEC] Minimum: 1 [DEC] Maximum: 10 [DEC]

Figure 176: BIOS Chipset Setup Menu – PCH-IO Configuration – SerialIO Configuration – Serial IO UART0/1 Settings

Aptio Setup – AMI		
Chipset		
Serial IO UART0/1 Settings		
Hardware Flow Control	[Disabled]	
DMA Enable	[Enabled]	→←: Select Screen
Power Gating	[Enabled]	↑ ↓: Select Item
		Enter: Select
Timing parameters disabled		+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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Feature	Option	Description
Hardware Flow Control	[Disabled], [Enabled]	When enabled configurations additional 2 GPIO pads for use as RTS/CTS signals for UART
DMA Enable	[Disabled], [Enabled]	[Enabled]: UART OS driver will use DMA when possible. [Disabled]: OS driver will enforce PIO mode
Power Gating	[Disabled], [Enabled], [Auto]	[Disabled]: No _PS0 _PS3 support, device is left in D0, after initialization [Enabled]: _PS0 _PS3 that supports getting device out of reset [Auto]: _PS0 and _PS3 detection through ACPI if device was initialized prior to first PG. If it was used (DBG2) PG is disabled

Figure 177: BIOS Chipset Setup Menu – PCH-IO Configuration – SCS Configuration

Aptio Setup – AMI		
Chipset		
eMMC 5.1 Controller	[Disabled]	
eMMC 5.1 HS400 Mode*	[Disabled]	
Enable HS400 Software tuning*(1)	[Disabled]	→←: Select Screen
Driver Strength*	[40 Ohm]	↑ ↓: Select Item
eMMC 5.1 HS200 Mode*(2)	[Enabled]	Enter: Select
UFS 2.0 Controller 1	[Disabled]	+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
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* These items appear only when enabling eMMC 5.1 Controller.
(1) This item appears only when enabling eMMC 5.1 HS400 Mode.
(2) This item appears only when disabling eMMC 5.1 HS400 Mode.

Feature	Option	Description
eMMC 5.1 Controller	[Disabled], [Enabled]	Enable or disable SCS eMMC 5.1 Controlller
eMMC 5.1 HS400 Mode	[Disabled], [Enabled]	Enable or disable SCS eMMC 5.1 HS400 Mode
Enable HS400 Software tuning	[Disabled], [Enabled]	Software tuning should improve eMMC HS400 stability at the expense of boot time
Diver Strength	[33 Ohm], [40 Ohm], [50 Ohm]	Set I/O driver strength
eMMC 5.1 HS200 Mode	[Disabled], [Enabled]	Enable or disable SCS eMMC 5.1 HS200 Mode
UFS 2.0 Controller 1	[Disabled], [Enabled]	Enable or disable UFS 2.0 Controller

Figure 178: BIOS Chipset Setup Menu – PCH-IO Configuration – ISH Configuration

Aptio Setup – AMI	
Chipset	
ISH is not available	
	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Read only.

Figure 179: BIOS Chipset Setup Menu – PCH-IO Configuration – Pch Thermal Throttling Control

Aptio Setup – AMI		
Chipset		
Thermal Throttling Level	[Suggested Setting]	
Thermal Throttling (1)	[Disabled]	
TT State 13 (1)	[Disabled]	
Thermal Throttling Lock (1)	[Disabled]	
T0 Level (1)	0	
T1 Level (1)	0	
T2 Level (1)	0	
DMI Thermal Setting	[Suggested Setting]	
DMI Thermal Sensor Autonomous Width (2)	[Disabled]	
Thermal Sensor 0 Width (2)	[x8]	
Thermal Sensor 1 Width (2)	[x4]	
Thermal Sensor 2 Width (2)	[x2]	
Thermal Sensor 3 Width (2)	[x1]	
SATA Thermal Setting	[Suggested Setting]	
Port 0 (3)		
T1 Multipler (3)	[x1]	
T2 Multipler (3)	[x2]	
T3 Multipler (3)	[x4]	
Alternate Fast Init Tdispatch (3)	[Disabled]	
Tdispatch (3)	[~32ms]	→←: Select Screen
Tinactive (3)	[~32ms]	↑ ↓: Select Item

Aptio Setup – AMI		
Chipset		
Port 1 [3]		Enter: Select
T1 Multipler [3]	[x1]	+/-: Change Opt.
T2 Multipler [3]	[x2]	F1: General Help
T3 Multipler [3]	[x4]	F2: Previous Values
Alternate Fast Init Tdispatch [3]	[Disabled]	F3: Optimized Defaults
Tdispatch [3]	[~32ms]	F4: Save & Exit
Tinactive [3]	[~32ms]	ESC: Exit
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[1] These items appear only when selecting Manual for Thermal Throttling Level.
[2] These items appear only when selecting Manual for DMI Thermal Setting.
[3] These items appear only when selecting Manual for SATA Thermal Setting.

Feature	Option	Description
Thermal Throttling Level	[Suggested Setting], [Manual]	Determine if use Intel suggested setting
Thermal Throttling	[Disabled], [Enabled]	Enable / Disable the thermal throttling status control
TT State 13	[Disabled], [Enabled]	PMSync state 13 will force at least T2 state
Thermal Throttling Lock	[Disabled], [Enabled]	Lock the entire TL register
T0 Level	Value input	If Trip Point Temperature <= T0Level, the system is in T0 state
T1 Level	Value input	If T1Level >= Trip Point Temperature > T0Level, the system is in T1 state
T2 Level	Value input	If T2Level >= Trip Point Temperature > T1Level, the system is in T2 state
DMI Thermal Setting	[Suggested Setting], [Manual]	Determine if use Intel suggested setting
DMI Thermal Sensor Autonomous Width	[Disabled], [Enabled]	Enable / Disable Thermal Sensor initiated Autonomous Width Negotiation
Thermal Sensor 0/1/2/3 Width	[x1], [x2], [x4], [x8], [x16]	Determine the DMI Link Width when the output from the Thermal Sensor is T0/1/2/3
SATA Thermal Setting	[Suggested Setting], [Manual]	Determine if use Intel suggested setting
T1/2/3 Multipler	[Disabled], [x1], [x2], [x4]	Determine the value of SATA Port T1/2/3 Multipler

Feature	Option	Description
Alternate Fast Init Tdispatch	[Disabled], [Enabled]	Enable / Disable SATA Port Alternate Fast Init Tdispatch
Tdispatch	[~32ms], [~128ms], [~8ms]	Determine the value of SATA Port Tdispatch
Tinactive	[~32ms], [~128ms], [~8ms]	Determine The value of SATA Port Tinactive

Figure 180: BIOS Chipset Setup Menu – PCH-IO Configuration – FIVR Configuration

Aptio Setup – AMI		
Chipset		
External V1P05 Rail Sx/S0ix Configuration		
Enable Rail in S0i1/S0i2	[Disabled]	
Enable Rail in S0i3	[Disabled]	
Enable Rail in S3	[Disabled]	
Enable Rail in S4	[Disabled]	
Enable Rail in S5	[Disabled]	
Enable Rail in S0	[Disabled]	
External Vnn Rail Sx/S0ix Configuration		
Enable Rail in S0i1/i2	[Disabled]	
Enable Rail in S0i3	[Disabled]	
Enable Rail in S3	[Disabled]	
Enable Rail in S4	[Disabled]	
Enable Rail in S5	[Disabled]	
Enable Rail in S0	[Disabled]	
External Vnn Rail Voltage Configuration at S0 and S0ix	[0.78V@Bypass – 0.78V@Bypass – 1.05V@Internal]	
External Rails Voltage and Current settings		
External V1P05 Icc Max Value	500	
External Vnn Icc Max Value	500	
VCCIN_AUX voltage rail timing configuration		→←: Select Screen
Retention to Low Current Mode	43	↑ ↓: Select Item
Retention to High Current Mode	54	Enter: Select
Low to High Current Mode	12	+/-: Change Opt.
Off to High Current Mode	150	F1: General Help
		F2: Previous Values

Aptio Setup – AMI		
Chipset		
FIVR Dynamic PM	[Disabled]	F3: Optimized Defaults
		F4: Save & Exit
VCCST ICCMax Control	[Enabled]	ESC: Exit
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Feature	Option	Description
Enable Rail in S0i1/S0i2/S0i3/S3/S4 /S5/S0	[Disabled], [Enabled]	Enables External V1P05 / Vnn Rail in corresponding Sx/S0ix
External Vnn Rail Voltage Configuration at S0 and S0ix	[0.78V@Bypass – 0.78V@Bypass – 1.05V@Internal], [1.05V@Bypass – 1.05V@Bypass – 1.05V@Bypass]	Configures TARGET_VOLT_LEVEL for External Rail
External V1P05 / Vnn Icc Max Value	Value input	Icc Max Value for external V1p05 / Vnn rail. Expressed in mA. Accepted value are between 0 and 500 mA.
Retention to Low Current Mode	Value input	Transition time in microseconds from Off (0V) to High Current Mode Voltage. This field has 1us resolution.
Retention to High Current Mode	Value input	Transition time in microseconds from Retention Mode Voltage to High Current Mode Voltage. This field has 1us resolution.
Low to High Current Mode	Value input	Transition time in microseconds from Low Current Mode Voltage to High Current Mode Voltage. This field has 1us resolution.
Off to High Current Mode	Value input	Transition time in microseconds from Off (0V) to High Current Mode Voltage. This field has 1us resolution. 0 = Transition to 0V is disabled. The value must be greater than or equal to VccST board FET ramp time.
FIVR Dynamic PM	[Disabled], [Enabled]	Enable / Disable FIVR Dynamic Power Management
VCCST ICCMax Control	[Disabled], [Enabled]	Enable / Disable FIVR VCCST ICCMax Control

Figure 181: BIOS Chipset Setup Menu – PCH-IO Configuration – PMC Configuration

Aptio Setup – AMI	
Chipset	
> PMC ADR Configuration	
	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Figure 182: BIOS Chipset Setup Menu – PCH-IO Configuration – PMC Configuration – PMC ADR Configuration

Aptio Setup – AMI		
Chipset		
ADR Enable	[Platform-POR]	
Host Partition Reset ADR Enable*	[Enabled]	
ADR timer 1 expire time*	32	→←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
ADR timer 1 time unit*	[1s]	
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* These items appear only when enabling ADR enable.

Feature	Option	Description
ADR enable	[Platform-POR], [Enabled], [Disabled]	Enable asynchronous DRAM refresh
Host Partition Reset ADR Enable	[Platform-POR], [Enabled], [Disabled]	Enables / Disables ADR on Host Partition Reset
ADR timer 1 expire time	Value input	Type desired ADR timer expire time, valid values - <1, 256>. Entered time is scaled by ADR timer time unit.

Feature	Option	Description
ADR timer 1 time unit	[1us], [10us], [100us], [1ms], [10ms], [100ms], [1s], [10s]	Select ADR timer time unit.

8.2.4. Security Setup Menu

The Security setup menu provides information about the passwords and functions for specifying the security settings. The passwords are case-sensitive. The 3.5"-SBC-AML/ADN/AMH/ADH provides no factory-set passwords.

NOTICE

If there is already a password installed, the system asks for this first. To clear a password, simply enter nothing and acknowledge by pressing <ENTER>. To set a password, enter it twice and acknowledge by pressing <ENTER>.

Figure 183: BIOS Security Setup Menu

Aptio Setup – AMI					
Main	**Advanced**	**Chipset**	**Security**	**Boot**	**Save & Exit**
Password Description					
If ONLY the Administrator's password is set, then this only limits access to Setup and is only asked for when entering Setup					
If ONLY the User's password is set, then this is a power on password and must be entered to boot or enter Setup. In Setup the User will have Administrator rights					
The password length must be in the following range:					
Minimum Length		3		→ ←: Select Screen	
Maximum length		20		↑ ↓ : Select Item	
				Enter: Select	
Administrator Password				+/-: Change Opt.	
User Password				F1: General Help	
				F2: Previous Values	
> Secure Boot				F3: Optimized Defaults	
				F4: Save & Exit	
				ESC: Exit	
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Feature	Description
Administrator Password	Set administrator password
User Password	Set user password

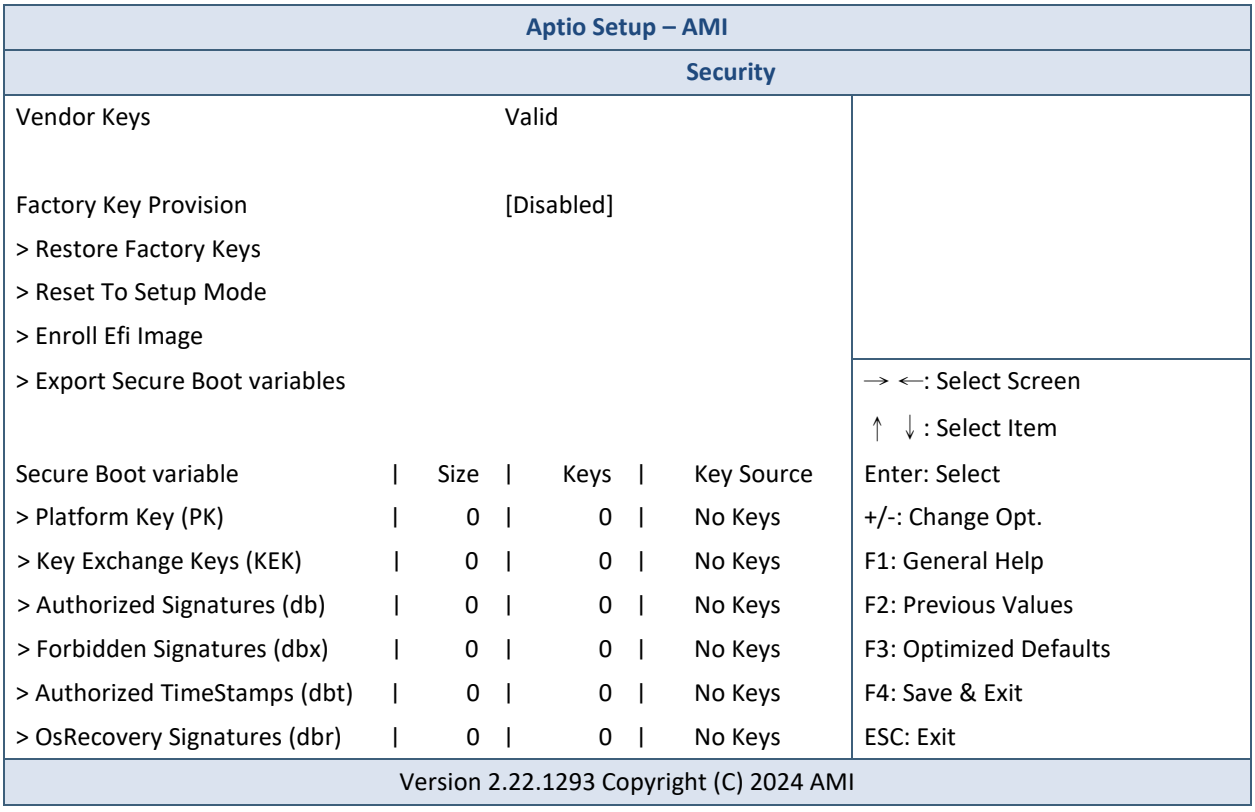
If only the administrator's password is set, then only access to setup is limited. The password is only entered when entering setup.

If only the user's password is set, then the password is a power on password and must be entered to boot or enter setup. Within the setup menu the user has administrator rights.

Password length requirements are maximum 20 characters and minimum 3 characters.

This symbol also indicates detail information about the specific product configuration.

Figure 184: BIOS Security Setup Menu – Secure Boot – Key Management



Feature	Option	Description
Factory Key Provision	[Disabled], [Enabled]	Install factory default Secure Boot keys after the platform reset and while the System is in Setup mode.
Reset Factory Keys	[Yes], [No]	Force System to User Mode. Install factory default Secure Boot key databases.
Reset to Setup Mode	[Yes], [No]	Delete all Secure Boot key databases from NVRAM.
Enroll Efi Image	Select a File system	Allow the image to run in Secure Boot mode. Enroll SHA256 Hash certificate of a PE image into Authorized Signature Database (db).
Export Secure Boot variables	Select a File system	Save NVRAM content of Secure Boot variables to a file
Platform Key (PK)	[Details], [Export], [Update], [Delete]	Enroll Factory Defaults or load certificates from a file: 1. Public Key Certificate: (a) EFI_SIGNATURE_LIST (b) EFI_CERT_X509 (DER) (c) EFI_CERT_RSA2048 (bin) (d) EFI_CERT_SHAXXX 2. Authenticated UEFI Variable 3. EFI PE / COFF Image (SHA256) Key Source: Factory, Modified, Mixed
Key Exchange Keys (KEK)	[Details], [Export], [Update], [Append], [Delete]	
Authorized Signatures (db)	[Details], [Export],	

Feature	Option	Description
	[Update], [Append], [Delete]	
Forbidden Signatures (dbx)	[Details], [Export], [Update], [Append], [Delete]	
Authorized TimeStamps (dbt)	[Update], [Append]	
OsRecovery Signatures (dbr)	[Update], [Append]	

Figure 185: BIOS Security Setup Menu – Secure Boot

Aptio Setup – AMI		
Security		
System Mode	Setup	
Secure Boot	[Disabled]	→←: Select Screen
	Not Active	↑ ↓: Select Item
		Enter: Select
Secure Boot Mode	[Standard]	+/-: Change Opt.
> Restore Factory Keys*		F1: General Help
> Reset To Setup Mode		F2: Previous Values
		F3: Optimized Defaults
> Key Management*		F4: Save & Exit
		ESC: Exit
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*These items are selectable only when selecting Custom for Secure Boot Mode.

Feature	Option	Description
Secure Boot	[Disabled], [Enabled]	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.
Secure Boot Mode	[Standard], [Custom]	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	[Yes], [No]	Force System to User Mode. Install factory default Secure Boot key databases.

8.2.4.1. Remember the Password

It is highly recommended to keep a record of all passwords in a safe place. Forgotten passwords results in being locked out of the system.
If the system cannot be booted because the User Password or the Supervisor Password are not known, contact Kontron Support for further assistance.

HDD security passwords cannot be cleared using the above method.

8.2.5. Boot Setup Menu

The boot setup menu lists the boot device priority order, that is generated dynamically.

Figure 186: BIOS Boot Setup Menu

Aptio Setup – AMI					
Main	**Advanced**	**Chipset**	**Security**	**Boot**	**Save & Exit**
Boot Configuration					
Setup Prompt Timeout		1			
Bootup NumLock State		[On]			
Quiet Boot		[Disabled]			
Fixed Boot Order Mode		[Disabled]			
Boot Option Priorities (1)					
Boot Option #1 (1)		[UEFI: Built-in EFI Shell]			
Fast Boot		[Disabled]		→ ←: Select Screen	
SATA Support (2)		[Last Boot SATA Devices Only]		↑ ↓: Select Item	
NVMe Support (2)		[Enabled]		Enter: Select	
UFS Support (2)		[Enabled]		+/-: Change Opt.	
VGA Support (2)		[EFI Driver]		F1: General Help	
USB Support (2)		[Full Initial]		F2: Previous Values	
PS2 Devices Support (2)		[Enabled]		F3: Optimized Defaults	
Network Stack Driver Support (2)		[Disabled]		F4: Save & Exit	
Redirection Support (2)		[Disabled]		ESC: Exit	
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(1) These items appear only when disabling Fixed Boot Order Mode.
(2) These items appear only when enabling Fast Boot.

Feature	Option	Description
Setup Prompt Timeout	Value Input	Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.
Bootup NumLock State	[On], [Off]	Select the keyboard NumLock state [On]: The keys on the keypad will act as numeric keys. [Off]: The keys on the keypad will act as cursor keys.
Quiet Boot	[Disabled], [Enabled]	Enables or disables Quiet Boot option
Fixed Boot Order Mode	[Disabled], [Enabled]	If enabled then 'Fixed Order Boot Mode' is used, otherwise 'BCP boot order' (default). NOTE: If you changed this setting please immediately save & exit and re-enter setup to apply further changes on boot settings!
Boot Option #1	[UEFI: Built-in EFI Shell], [Disabled]	Sets the system boot order

Feature	Option	Description
Fast Boot	[Disabled], [Enabled]	Enables or disables boot with initialization of a minimal set of devices required to launch active boot option. Has no effect for BBS boot options.
SATA Support	[Last Boot SATA Devices Only], [All SATA Devices]	If Last Boot SATA Devices Only, Only last boot SATA devices will be available in Post. If All SATA Devices, all SATA devices will be available in OS and Post.
NVMe Support	[Disabled], [Enabled]	If Disabled, NVMe device will be skipped.
UFS Support	[Disabled], [Enabled]	If Disabled, UFS device will be skipped.
VGA Support	[Auto], [EFI Driver]	If Auto, only install Legacy OpRom with Legacy OS and logo would NOT be shown during post. Efi driver will still be installed with EFI OS.
USB Support	[Disabled], [Full Initial], [Partial Initial]	If Disabled, all USB devices will NOT be available until after OS boot. If Partial Initial, USB Mass Storage and specific USB port / device will NOT be available before OS boot. If Enabled, all USB devices will be available in OS and Post.
PS2 Devices Support	[Disabled], [Enabled]	If Disabled, PS2 devices will be skipped.
Network Stack Driver Support	[Disabled], [Enabled]	If Disabled, Network Stack Driver will be skipped.
Redirection Support	[Disabled], [Enabled]	If disable, Redirection function will be disabled.

8.2.6. Save & Exit Setup Menu

The exit setup menu provides functions for handling changes made to the UEFI BIOS settings and the exiting of the setup program.

Figure 187: BIOS Save & Exit Setup Menu

Aptio Setup – AMI					
Main	**Advanced**	**Chipset**	**Security**	**Boot**	**Save & Exit**
Save Options					
Save Changes and Exit					
Discard Changes and Exit					
Save Changes and Reset					
Discard Changes and Reset					
Save Changes					
Discard Changes				→ ←: Select Screen	
				↑ ↓: Select Item	
Default Options				Enter: Select	
Restore Defaults				+/-: Change Opt.	
Save as User Defaults				F1: General Help	
Restore User Defaults				F2: Previous Values	
				F3: Optimized Defaults	
Boot Override				F4: Save & Exit	
UEFI: Built-in EFI Shell				ESC: Exit	
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Feature	Description
Save Changes and Exit	Exit system setup after saving the changes.
Discard Changes and Exit	Exit system setup without saving any changes.
Save Changes and Reset	Reset the system after saving the changes.
Discard Changes and Reset	Reset system setup without saving any changes.
Save Changes	Save Changes done so far to any of the setup options.
Discard Changes	Discard Changes done so far to any of the setup options.
Restore Defaults	Restore / Load Default values for all the setup options.
Save as User Defaults	Save the changes done so far as User Defaults.
Restore User Defaults	Restore the User Defaults to all the setup options.
UEFI: Built-in EFI Shell	This group of functions includes a list of tokens, each of them corresponding to one device within the boot order. Select a drive to immediately boot that device regardless of the current boot order. If booting to EFI Shell this way, an exit from the shell returns to Setup.

9/Technical Support

For technical support contact our Support Department:

- E-mail: support@kontron.com
- Phone: +49-821-4086-888

Make sure you have the following information available when you call:

- Product ID Number (PN)
- Serial Number (SN)

The serial number can be found on the Type Label, located on the product's rear panel.

Be ready to explain the nature of your problem to the service technician.

9.1. Returning Defective Merchandise

All equipment returned to Kontron must have a Return of Material Authorization (RMA) number assigned exclusively by Kontron. Kontron cannot be held responsible for any loss or damage caused to the equipment received without an RMA number. The buyer accepts responsibility for all freight charges for the return of goods to Kontron's designated facility. Kontron will pay the return freight charges back to the buyer's location in the event that the equipment is repaired or replaced within the stipulated warranty period. Follow these steps before returning any product to Kontron.

1. Visit the RMA Information website: https://www.kontron.com/en/support/rma-information.
2. Download the RMA Request sheet for Kontron Europe GmbH and fill out the form. Take care to include a short, detailed description of the observed problem or failure and to include the product identification Information (Name of product, Product number and Serial number). If a delivery includes more than one product, fill out the above information in the RMA Request form for each product.
3. Send the completed RMA-Request form to the fax or email address given below at Kontron Europe GmbH. Kontron will provide an RMA-Number.
4. Kontron Europe GmbH
   RMA Support
   Phone: +49 (0) 821 4086-0
   Fax: +49 (0) 821 4086 111
   Email: service@kontron.com
5. The goods for repair must be packed properly for shipping, considering shock and ESD protection.

Goods returned to Kontron Europe GmbH in non-proper packaging will be considered as customer caused faults and cannot be accepted as warranty repairs.

6. Include the RMA-Number with the shipping paperwork and send the product to the delivery address provided in the RMA form or received from Kontron RMA Support.

10/ Storage and Transportation

10.1. Storage

If the product is not in use for an extended period time, disconnect the power plug from the power supply. If it is necessary to store the product then re-pack the product as originally delivered to avoid damage. The storage facility must meet the product's environmental storage requirements as stated within this user guide. Kontron recommends keeping the original packaging material for future storage or warranty shipments.

10.2. Transportation

To ship the product, use the original packaging, designed to withstand impact and adequately protect the product. When packing or unpacking products, always take shock and ESD protection into consideration and use an EOS/ESD safe working area.

11/ Warranty

Due to their limited-service life, parts that by their nature are subject to a particularly high degree of wear (wearing parts) are excluded from the warranty beyond that provided by law. This applies to the lithium battery, for example.

12/ Disposal

12.1. Disposal

Dispose of the product in accordance with country, state, or local regulations and requirements as part of your disposal and decommissioning policies or recycle the product or parts of the product for re-use after performing data sanitization to erase sensitive data stored on the product's memory devices.

When disposing of the product

- Remove any product labels from the product that could indicate ownership and provide a clue to the type of data stored on the memory device.
- Comply with your company's environmental requirements and the requirements of Waste Electrical and Electronic Equipment (WEEE) directive.
- Use data sanitization guidelines to ensure that data sensitive to your business and/or confidential or proprietary data and software is removed from the product using a data sanitization method that stops the data from being retrieved or reconstructed.

12.2. WEEE Compliance

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 becomes 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.

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

12.3. Data Sanitization

Data sanitization is the process of permanently erasing or destroying sensitive data on the product's memory devices to prevent unauthorized access to data sensitive to your business and/or confidential/proprietary data stored on the memory devices.

When designing a system, users must plan for data sanitization and design in memory devices that are easier to sanitize, memory devices from manufactures that provide an effective data erasure tool or a return to factory default command.

When performing data sanitization, the user must consider if the product's memory devices contain sensitive data and develop a data sanitization plan to erase all sensitive data in accordance with country, state, or local data sanitization regulations and requirements or as part of your disposal and decommissioning policies.

Data Sanitization

Users are responsible for erasing sensitive data on memory devices in accordance with country, state, or local data sanitization regulations and requirements, or as part of your disposal and decommissioning policies.

Kontron recommends performing data sanitization when reusing the product in a different user environment, sending the product in for repair, disposing of the product or decommissioning the product.

General guidelines when performing data sanitization on memory devices containing data sensitive to your business and/or confidential/proprietary data are:

- Before powering down, consider if power is required to perform data sanitization on the product's memory devices.
- When disconnected from the power source, dismantle all removable memory devices from the product and erase sensitive data.
- Volatile memory devices only store data temporarily. Data on volatile memory can be erased easily by disconnecting the power or removing the battery for approximately 24 hours.
- Non-volatile memory devices store data permanently and retain information when disconnected from power. Data on von-volatile memory, and must be actively erased using one of the following methods:
  - Use an accredited third-party software tool that provides an audit trail, capable of performing a complete data clean including areas such as hidden data and bad blocks not accessed by general service-based utilities.
  - Use the manufacture's data erasure tool or return to factory default command (if provided by the manufacturer). The manufactures tools and commands have been designed to fulfil the data sanitization requirement of the manufacture's specific memory device(s).
  - Use the physical destruction method on memory devices that cannot be securely erased using software. The aim of the destruction is to break the silicon die within the chips package to prevent reading data from the die. If this service is performed by a third-party, obtain destruction certificates for confirmation.
- Always verify that all sensitive data has been effectively sanitized.

Dismantle Removable Memory

Dismantle all removable memory devices and erase sensitive data for reuse by using:

- An accredited third-party software tool.
- Manufacture's data erasure tool' or 'return to factory default command'. (if provided)

If the removable memory is not for reuse, physically destruct the memory according to data sanitization guidelines.

Erase Data

To ensure that forensic tools cannot be used to recover sensitive data:

- Use an accredited third-party software tool, with an audit trail, capable of performing a complete data clean including areas such as hidden data and bad blocks not accessed by general service-based utilities.
- Use the manufacture's data erasure tool or return to factor default command designed to fulfil data sanitization requirement of the manufacture's specific memory device(s).

Physical Destruction

When physically destructing the memory:

- Follow proper safety protocols.
- Break the chip packaged silicon die into two or more parts, fragments <= 6 mm.
- Check both sides as memory devices may be positioned on the rear side.
- Use a third-party destruction company providing certificates for confirmation.

12.4. Statement of Memory Volatility

The 3.5”-SBC-AML/ADN/AMH/ADH statement of memory volatility provides the user with a detailed list of the product’s memory devices and their volatility, to enable the user to develop a suitable data sanitization plan.

Note that not all listed memory devices may be part of your delivered product. Some memory devices may be configuration options. Users are responsible for considering the memory devices installed on the product and must take appropriate action to clear the memory if required.

Third-party devices such as M.2 modules installed on the product may include memory devices and should be removed by the user before disposing of the product. It is the responsibility of the user to observe that the third-party devices are removed according to the manufacturer’s instructions.

In some cases, special tools and/or software are necessary to access the memory

The statement of memory volatility list, is an overview of all the known possible memory devices and due to configuration options may differ from your delivered product.

Table 55: 3.5”-SBC-AML/ADN/AMH/ADH Statement of Memory Volatility

Memory Type	Ref. # /Loc.	Memory Size	Volatility	Retain Data when Power Off	Alterable in Field[1]	Battery Backed Up	Data Type	Write Protected	Emergency Erase	Proccess to Clear
DDR										
DDR5 SO-DIMM		Up to 16 GB	Volatile	No	Yes	No	User Data	No	No	NA
EC										
Embedded Controller MEC1521		Code Storage: 480 KB (Code + Data) Data RAM: 32 KB	Non-volatile (Code storage) Volatile (RAM)	Yes	Yes	No	Embedded controller config	Yes	No	Perform EC FW update
CMOS-FLASH SPI MX25V1635FM2I		16 Mbit	Non-volatile	Yes	Yes	No	EFI Boot	Yes	Yes	Perform BIOS recovery
LAN										
FLASH SPI W25Q16JVSSIQ		16 Mbit	Non-volatile	Yes	Yes	No	EFI Boot	Yes (SW)	No	Perform BIOS recovery
BIOS										
FLASH SPI W25Q256JVEIQ		256 Mbit	Non-volatile	Yes	Yes	No	EFI Boot	Yes (SW)	No	Perform BIOS recovery
EEPROM										
EEPROM AT24C32E-SSHM-T		32 Kbit	Non-volatile	Yes	Yes	No	Module ID Data	Yes	No	NA

Memory Type	Ref. # /Loc.	Memory Size	Volatility	Retain Data when Power Off	Alterable in Field[1]	Battery Backed Up	Data Type	Write Protected	Emergency Erase	Proccess to Clear
LVDS										
EEPROM Chrontel CH9904		64 Kbits	Non-volatile	Yes	Yes	No	Module ID Data	Yes	No	NA
PD										
F75183I		uC internal RAM 256 Byte / Flash ROM Size: 16 KByte	Non-volatile	Yes	No	No	PSC Config.	Yes	No	NA (Board will not operate with modified data)
VCORE										
MP2964R		8 Kbit	Non-volatile	Yes	No	No	VR Config.	No	No	NA
TPM										
SLB 9672XU2.0		51 KByte	Non-volatile	Yes	Yes	No	User Data	Yes	No	Perform clear item under OS

[1] In some cases special tools and/or software are necessary to access the memory.

13/ Cyber Security

Cyber security is an important aspect to consider when installing, operating, maintaining and disposing of the product. This chapter provides cyber security guidelines for the user.

Security White Paper

For cyber security guidelines to protect your Kontron product from potential cyber security threats, refer the Kontron Security Guideline Whitepaper.

Security Measures

Kontron is not aware of the final target end user environment in which the product operates. It is not possible for Kontron to provide precise instructions for your cyber security measures. Kontron strives to provide hints for considerations for your threat analysis and to point out particular security mechanisms implemented in Kontron products.

13.1. Security Defense Strategy

When developing your security defense strategy consider implementing the following guidelines to help you effectively secure the product:

- Policies and procedures developed in association with the product's/end environment's security.
- Instructions and recommendations for periodic security maintenance activities and reporting product security incidents.
- Security network controls/setting such as firewall rules.
- Third-party software tools that further protect the product.
- Authentication to access the product, limit user privileges and managing user accounts.
- Data encryption.
- Reduced number of potential security entry points.
- BIOS/OS and security updates that do not compromise the product's operation or defense in depth strategy.
- User accounts with length and complexity requirements.
- Supplied default passwords are changed.
- Limited network access (IP address range).
- Installation of anti-virus and malware software.
- Network access requirements such as VPN.

Appendix: List of Acronyms

AC	Alternating Current
AWG	American Wire Gauge
BIOS	Basic Input Output System
CAN	Controller Area Network
CE	Conformitè Europëenne
COM	Communication port
DC	Direct Current
DIMM	Dual In-line Memory Module
DOC	Declaration of Conformity
DDIO	Digital Data Input/Output
DDR5	Double Data Rate 5
DP	Display Port
ECC	Error Code Correction
eDP	Embedded DisplayPort
EMC	ElectroMagnetic compatibility
ESD	ElectroStatic Discharge
FCC	Federal Communications Commission
GB	Ground Benign
GbE	Giga Bit Ethernet
GSPI	Generic Serial Peripheral Interface
HD	High Definition
HDMI	High Definition Multimedia Interface
IEC	International Electrotechnical Commission
I^2C	Inter-Intergrated Circuit
IOT	Internet of Things
LAN	Local Area Network
LED	Light Emitting Diode
LPC	Limited Power Source
LVDS	Low Voltage Differential Signaling
MBR	Master Boot Record
MDI	Media Dependent Interface
MFG mode	Manufacturing mode
MTBF	Mean Time Before Failure
NVME	Non-Volatile Memory Express
PCIe	Peripheral Component Interconnect Express
PN	Part Number
PS	Power Source
PVC	Polyviny Chloride
RAM	Random Access Memory
RMA	Return of Material Authorization
RoHS	Restriction of Hazardous Substances
RTC	Real Time Clock
RX	Receive
SATA	Serial Advanced Technology Attachment,
SD card	Secure Digital Card
SDP	Standard Data Port
SIM	Subscriber Identity Module
SM	System Management
SN	Serial Number
SPI	Serial Peripheral Interface
SP/DIF	Sony Philips / Digital Interface
SVGA	Super Video Graphics Array
TCP	Transmission Code protocol
TDP	Thermal Design Power
TFT	Thin-Film Transistors
TPM	Trusted Platform Module
TX	Transmit
UART	Universal Asynchronous Receiver Transmitter
UEFI	Unified Extensible Firmware Interface
UL	Underwriters Laboratories
USB	Universal Serial Bus
UTP	Unshielded twisted pair
UV	Ultra Violet
VESA	Video Electronics Standards Association
VGA	Video Graphics Array
WEEE	Waste Electrical and Electronic Equipment
WXGA	Wide Extended Graphics Array
XGA	Extended Graphics Array

About Kontron

Kontron is a global leader in IoT/Embedded Computing Technology (ECT) and offers individual solutions in the areas of Internet of Things (IoT) and Industry 4.0 through a combined portfolio of hardware, software and services. With its standard and customized products based on highly reliable state-of-the-art technologies, Kontron provides secure and innovative applications for a wide variety of industries. As a result, customers benefit from accelerated time-to-market, lower total cost of ownership, extended product lifecycles and the best fully integrated applications.

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