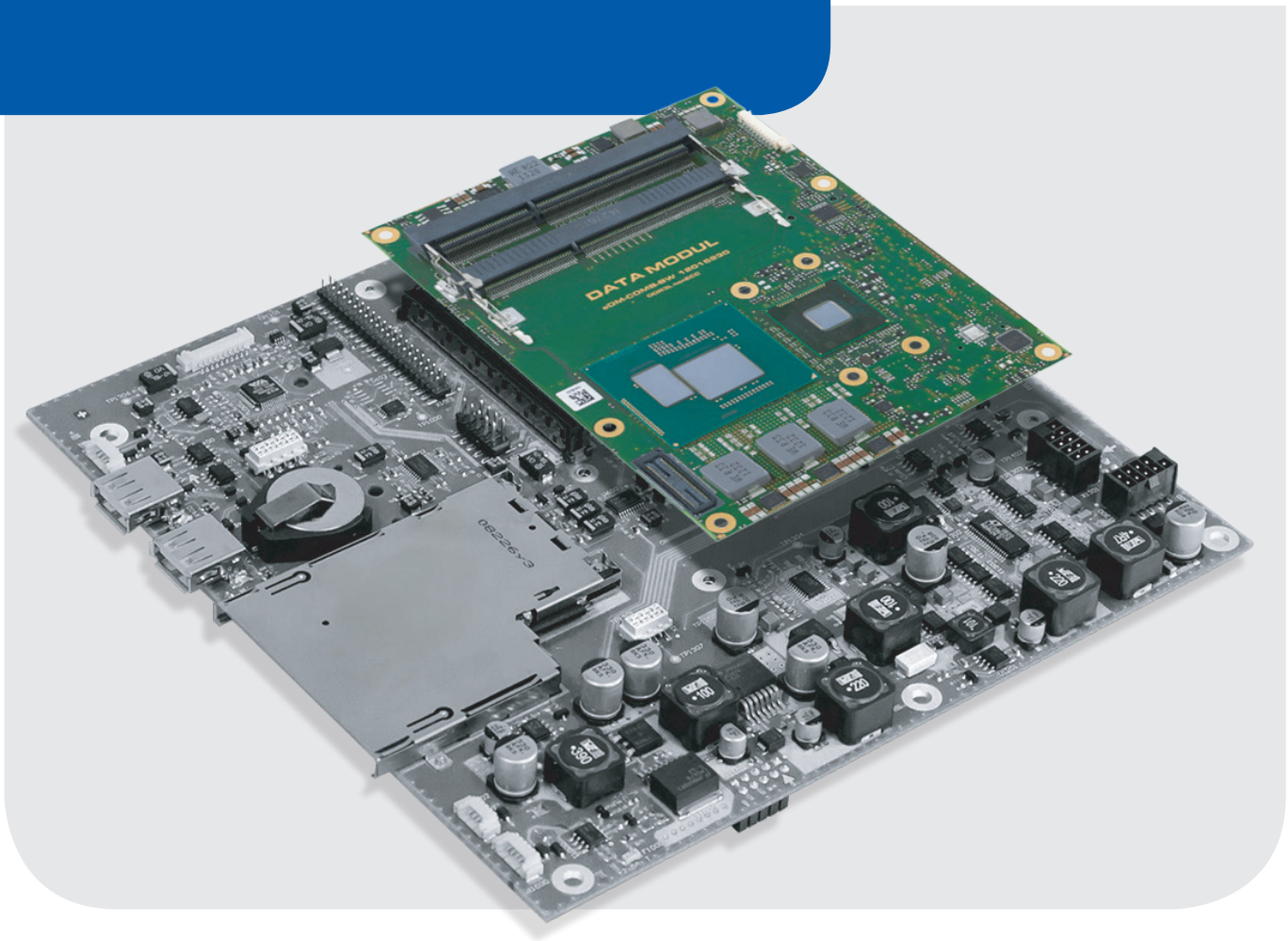
DATA MODUL

eDM-COMB-BW6



Revision History

Revision	Revision History	Date
00	First release	

Reference to this Specification
The purpose of all the figures and illustrations in this Specification is merely to provide a better explanation and can differ to the actual appearance of the board. They are to be understood as schematic representations.

[12023193 Rev. 00]

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Preface

About this Specification

This Specification contains information about the hardware components, features and BIOS setup of the eDM-COMB-BW6.
The Specification is intended for technically qualified personnel.

Danger Symbols and Levels

In this Specification, symbols are used to highlight important safety instructions and any advice relating to the device. The instructions should be followed very carefully to avoid any risk of accident, personal injury or property damage.

Danger Symbols

	Hazard point
	All DATA MODUL AG products are electrostatic sensitive devices and are packaged accordingly. Do not open or handle a DATA MODUL AG product except at an electrostatic-free workstation. Additionally, do not ship or store DATA MODUL AG products near strong electrostatic, electromagnetic, magnetic, or radioactive fields unless the device is contained within its original manufacturer's packaging. Be aware that failure to comply with these guidelines will void the DATA MODUL AG Limited Warranty.

Danger Levels

CAUTION	Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	Indicates a property damage message.

General Symbols

Notes that are marked with these symbols contain important or useful information for the operation respectively the handling of the device.

	Additional support or useful information.
	The crossed-out refuse bin indicates that the products must be properly recycled or disposed of appropriately in accordance with national legislation in the respective EU countries. If you wish to dispose of used electrical and electronic products outside the European Union, please contact your local authority so as to comply with the correct disposal method.

Certification

Data Modul AG is certified to ISO 9001:2008 and ISO 14001:2004 standards.

Disclaimer

The information in this Specification is subject to change without prior notice Data Modul.
Although this Specification has been created with the utmost care , we cannot give any guarantee or accept any liability regarding the information provided.

Warranty

The warranty period of the eDM-COMB-BW6 is 24 months starting at the date of delivery from Data Modul.

Technical Support

DATA MODUL's technicians and engineers are committed to providing the best possible technical support for our customers so that our products can be easily used and implemented. We request that you first visit our website at www.data-modul.com for the latest documentation, utilities and drivers, which have been made available to assist you. If you still require assistance after visiting our website then contact our technical support department by email at support@data-modul.com.

COM Express Specification Reference

PICMG COM Express® Specification Rev. 2.1.

http://www.picmg.org/

Terminology

Term	Description
COM	A serial port interface on IBM PC-compatible computers.
COM Express	New generation technology of Computer On Module.
CPU	Central Processing Unit
DDC	Display Data Channel
DDI	Digital Display Interfaces
DDR3	Double Data Rate third generation SDRAM memory technology
DP	Display Port
DVI	Digital Visual Interface
EN	European Norm
ESD	Electrostatic Discharge
GND	Ground
GPIO	General Purpose Input/Output
HD	High Definition
HDMI	High Definition Multimedia Interface
I²C	Inter-Integrated Circuit Bus
LAN	Local Area Network
LCD	Liquid Crystal Display
LPC	The Low Pin Count (LPC) Interface Specification for legacy I/O has facilitated the industry's transition toward ISA-less systems.
LVDS	Low Voltage Differential Signal
NA	Not Available
NC	Not Connected
PCB	Printed Circuit Board
PCH	Platform Controller Hub
PCIe	Peripheral Component Interconnect Express
PEG	PCI Express Graphics
RTC	Real Time Clock
SATA	Serial AT Attachment (serial interface standard for hard disks)
SBY	Standby
SMB	System Management Bus
SPI	Serial Peripheral Interface
TMDS	Transition Minimized Differential Signaling
TPM	Trusted Platform Module
VGA	Video Graphics Array
UART	A universal asynchronous receiver/transmitter that translates data between parallel and serial forms.
USB	Universal Serial Bus

Specifications

Supported Operating Systems

- Microsoft® Windows® 7 (32bit and 64bit)
- Microsoft® Windows® 8.X (32bit and 64bit)
- Microsoft® Windows® 10
- Linux (64 bit Yocto)
- Microsoft® Windows® Embedded 7 Standard (WES7 32 bit and 64 bit)
- Microsoft® Windows® Embedded 8 Standard (WES8)
- Microsoft® Windows® Embedded Compact 2013 (WEC2013)

Customized UEFI

DATA MODUL provides a UEFI firmware based on AMI Aptio-5 core. Specific features:

- Darkboot / Bootlogo support
- Legacy Free Operation
- Boot from external SPI as defined by COM Express specification
- Memory-initialization according to SPD, X.M.P. profiles supported
- LID and Sleep signals supported
- ACPI Wake Events - WOL S3-S5, USB S3-S5, LID S3, PwrBtn S3-S5
- AC Power Loss configurable by setup
- Spread Spectrum configurable by setup - default ON
- ACPI 4.0a.

Tools

DATA MODUL provides the BIOS update tool, CPLD update tool, API test tool, and Utility to add/change the bootlogo.

Standards & Certifications

Environmentalism

- 2011/65/EU (of 8. June 2011 directive of the European parliament and of the council on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS))
- 2006/1907/EU (of 18. December 2006 of the European parliament and of the council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH))
- 2012/19/EC (of 04. July 2012 directive of the European parliament and of the council on waste electrical and electronic equipment (WEEE))
- The packing complies with directive 1994/62/EU.

EMC Standards

EMI/EMC: according to EN55022

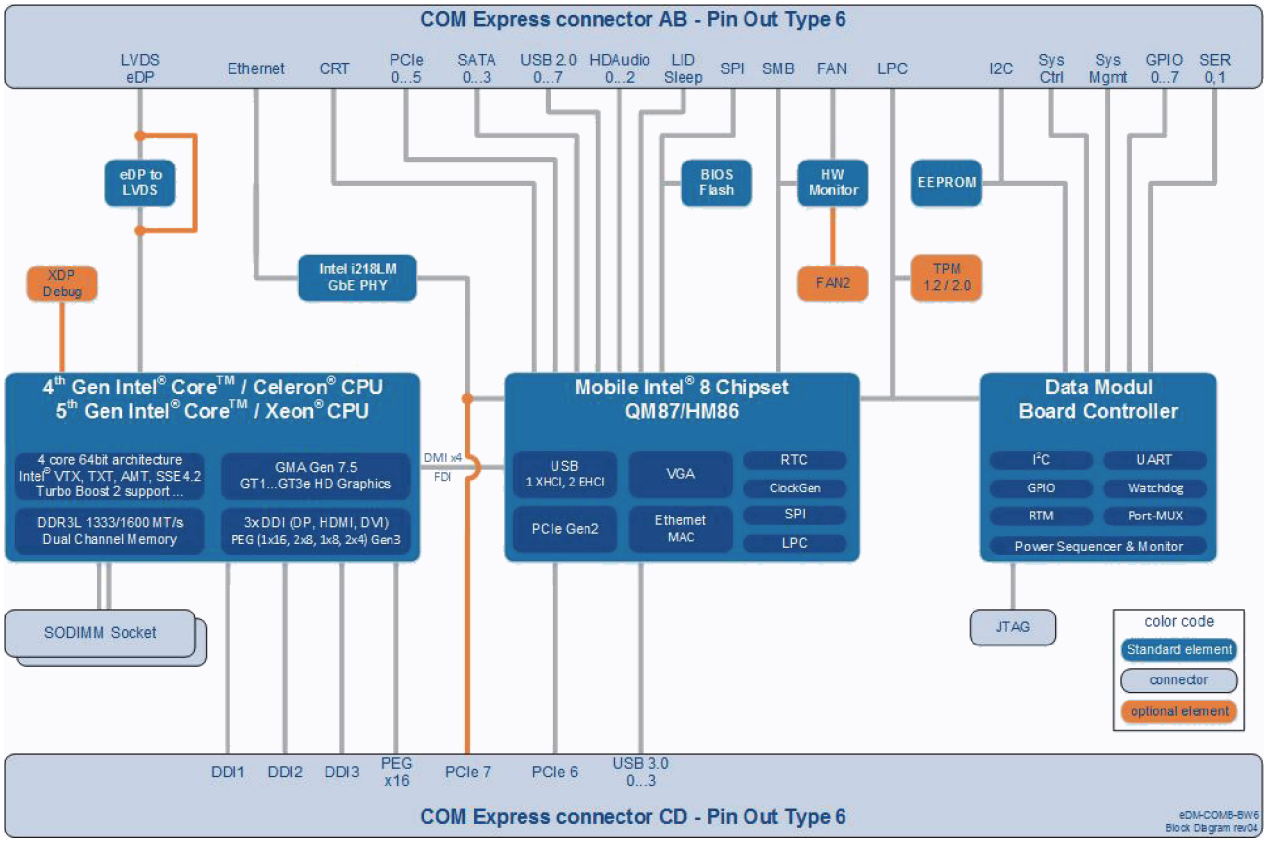
Safety

Designed to meet UL60950.

Shock & Vibration

Shock and Vibration according to IEC/EN60068-2-6 and IEC/EN60068-2-27.

Block Diagram



Ordering Information

Model Name	Part No.	Description
eDM-COMB-BW-i7-4700EQ	12014684	COM Express Type 6 Basic module with Intel® Core™ i7-4700EQ
eDM-COMB-BW-i7-5850EQ	12017850	COM Express Type 6 Basic module with Intel® Core™ i7-5850EQ
eDM-COMB-BW-i7-5700EQ	12017680	COM Express Type 6 Basic module with Intel® Core™ i7-5700EQ
eDM-COMB-BW-E3-1278LV4	12017852	COM Express Type 6 Basic module with Intel® Xeon® E3-1278L v4
eDM-COMB-BW-E3-1258LV4	12017861	COM Express Type 6 Basic module with Intel® Xeon® E3-1258L
eDM-COMB-BW-i5-4422E	12017862	COM Express Type 6 Basic module with Intel® Core™ i5-4422E
eDM-COMB-BW-i3-4110E	12017691	COM Express Type 6 Basic module with Intel® Core™ i3-4110E
eDM-COMB-BW-Celeron-2000E	12014136	COM Express Type 6 Basic module with Intel® Celeron™ 2000E
eDM-COMB-BW-Celeron-2002E	12014686	COM Express Type 6 Basic module with Intel® Celeron™ 2002E
eDM-COMB-BW-CF	12017847	Standard Cooling solution with fan
eDM-COMB-BW-CP	12017848	Standard Cooling solution passive

Platform Features

Platform

- Intel® Crescent Bay (Broadwell-H, Wildcat Point, Clarkville LAN)
- Intel® Shark Bay (Haswell-M, Lynx Point, Clarkville LAN)

CPU

The eDM-COMB-BW6 supports all available Haswell and Broadwell CPUs in BGA1364mpackage up to 47W TDP.

- Package: 37.5 mm x 32 mm BGA package (BGA1364)

- Features:
  - C-States: CO-C7
  - Up to 6MB unified cache
  - PEG Gen 3.0 8GT/s (1x16 / 2x8 / 1x8+2x4)
  - Configurable TDP and Low Power Mode (cTDP/LPM)
  - Intel® 64 Architecture
  - Intel® Turbo Boost Technology 2.0
  - Optional support Intel® Active management Technology 10.0 (AMT)
  - Intel® Virtualization Technology (VT-x)
  - Intel® Hyperthreading Technology (HTT)
  - Intel® Smart 2D Display Technology (S2DDT)
  - Intel® Advanced Vector Extension (AVX 2.0)
  - Intel® Rapid Memory Power Management (RMPM)
  - Intel® Graphics Render C-State (RC6)
- Security Features:
  - Intel® Secure Key
  - Optional support Intel® Trusted Execution Technology (TXT)
  - Optional support Intel® AES New Instructions (AES-NI)

Memory

- Two SO-DIMM sockets - Raw Card B and Raw Card F
- Memory type: DDR3L /DDR3L-RS non ECC
- Speed: 1333 MT/s (PC3-10600)/ 1600 MT/s (PC3-12800)

Raw Card Version	DIMM Capacity	DRAM Organization	No. of DRAM Devices	No. of Row / Col Address Bits	No. of Banks Inside DRAM	Page Size
B	1 GB	128 M x 8	8	14/10	8	8k
	2 GB	256 M x 8		15/10		
	4 GB	512 M x 8		16/10		
F	2 GB	128 M x 8	16	14/10		
	4 GB	256 M x 8		15/10		
	8 GB	512 M x 8		16/10		
	16 GB	1024 M x 8		17/10		

DDR3L / DDR3L-RS System Memory Timing Support

Segment	Transfer Rate (MT / s)	tCL (tCK)	tRCD (tCK)	tRP (tCK)	CWL (tCK)	DPC	CMD Mode
Quad Core BGA Processor with GT3/GT2 Graphics (H-Processor)	1333	8/9	8/9	8/9	7	1	1N/2N
						2	2N
Quad Core BGA Processor with GT2 Graphics (M-Processor)	1600	10/11	10/11	10/11	8	1	1N/2N
						2	2N
Dual Core rPGA Processor with GT2/GT1 Graphics (M-Processor)	1333	8/9	8/9	8/9	7	1	1N/2N
	1600	10/11	10/11	10/11	8	1	1N/2N

Graphics & Media

- Intel Gen 7.5 Clear Video Technology HD Support is a collection of video playback and enhancement features that improve the end user's viewing experience:
  - Encode / transcode HD content
  - Playback of high definition content including Blu-ray Disc™
  - Superior image quality with sharper, more colorful images
  - Playback of Blu-ray™ disc S3D content using HDMI (1.4a specification compliant with 3D)
- DirectX® Video Acceleration (DXVA) support for accelerating video processing
- Full AVC/VC1/MPEG2 HW Decode
- Advanced Scheduler 2.0, 1.0, XPDM support

- Windows® 8, Windows® 7, OSX, Linux® operating system support
- DirectX® 11.1, DirectX® 11, DirectX® 10.1, DirectX® 10, DirectX® 9 support
- OpenGL® 4.0 support
- Switchable Graphics muxless support for mobile platforms.

Valid Three Display Configurations through the Processor

Display 1	Display 2	Display 3	Maximum Resolution Display 1	Maximum Resolution Display 2	Maximum Resolution Display 3
HDMI	HDMI	DP	4096x2304 @ 24 Hz 2560x1600 @ 60 Hz		3840x2160 @ 60 Hz
DVI	DVI	DP	1920x1080 @ 60 Hz		3840x2160 @ 60 Hz
DP	DP	DP	3840x2160 @ 60 Hz		
VGA	DP	HDMI	1920x1080 @ 60 Hz	3840x2160 @ 60 Hz	4096x2304 @ 24 Hz 2560x1600 @ 60 Hz
eDP	DP	HDMI	3840x2160 @ 60 Hz	3840x2160 @ 60 Hz	4096x2304 @ 24 Hz 2560x1600 @ 60 Hz
eDP	DP	DP	3840x2160 @ 60 Hz	3840x2160 @ 60 Hz	
eDP	HDMI	HDMI	3840x2160 @ 60 Hz	4096x2304 @ 24 Hz 2560x1600 @ 60 Hz	

Notes: 1. Requires support od 2 channel DDR3L/DDR3L-RS-1600 MT/s configuration for driving 3 simultaneous 3840x2160 @ 60 Hz display resolutions.

2. DP and eDP resolutions in the above table are supported for 4 lanes with link data rate HBR2.

Any three displays can be supported simultaneously using the following rules:

- Maximum of two HDMIs
- Maximum of two DVIs
- Maximum of one HDMI and one DVI
- Any three DisplayPorts (DP)
- One VGA
- One eDP.

The COM Express graphics ports are connected as follows:

- DDI1 DP++ Interface 1 from CPU
- DDI2 DP++ Interface 2 from CPU
- DDI3 DP++ Interface 3 from CPU
- PEG PCIexpress Graphics Port from CPU
- LVDS Dual channel LVDS from eDP to LVDS converter
- VGA VGA Interface from PCH.

PCH/IO

Intel® 8 Series Chipset Lynx Point:

- 4x USB 3.0, 14x USB 2.0 (2x EHCI, 1x xHCI)
- 8x PCIe Gen 2.0 (5GT/s), 8x1/2x4/1x4 (L0 – L3 Link States)
- 6x SATA 6Gb/s AHCI, RAID, eSATA
- 1x VGA
- SPI for onboard/external Flash
- LPC for Embedded Controller / TPM / external SIO
- GPIOs, 1MHz SMB 2.0
- Intel® VT-d

- Intel® HD Audio
- RAID 0, 1, 5, 10
- Rapid Storage Technology
- Smart Response Technology.

LAN

Intel® Clarkville-LM GbE I128LM:

- 500mW max. Power, 6x6mm 48 pin, 0...85°C
- PCIe + SMBus Interface
- vPRO / AMT 9.x support
- Jumbo Frames-9K
- 1588 support.

Additional Interfaces & Functions

LVDS

The eDM-COMB-BW6 supports Dual channel LVDS 1/2x18/24bit up to 1920x1200 from an eDP2LVDS converter like NXP PTN3460. Optionally it is possible to bypass LVDS converter to redirect the eDP signals to the COM Express connector pins.

TPM

The eDM-COMB-BW6 supports a Trusted Platform Module using the Atmel AT97SC3204 TPM controller.

Hardware Monitor

Hardware Monitoring supports on the eDM-COMB-BW6 design using the Nuvoton NCT7802Y.
Hardware Monitor providing following information:

- CPU DIE temperature measured through PECI interface
- PCB temperature measured inside HWMonitor (place HWM at cool spot of PCB)
- Level of VCC module input voltage
- Level of 5V_SBY input voltage
- Level of VCCRTC voltage.

The Hardware Monitor provides control signals to operate one Fan connected at the COM Express baseboard fan connector and on board Connector.

DATA MODUL Board Controller

The DATA MODUL Embedded Controller (DMEC) implements a set of typical embedded peripheral features in the Computer-On-Module (CoM) including devices like GPIO, I2C, Watchdog timers, UARTs etc. Depending on the DATA MODUL board type, the DMEC device is connected to the chipset either via LPC or eSPI.

The DMEC Controller on the eDM-COMC-BS6 module provides the following functionality:

- Connected to LPC on Intel Braswell SoC
- Two UARTs
  - Speed up to 115200Bd
  - I/O Address/IRQ configurable via BIOS setup.
  - UART1 optionally supports RTS/CTS signals through GPIOs, configurable via BIOS setup.
- I2C controller
  - Controls up to three I2C busses via multiplexer.
  - Supports Automatic Bus Clear to prevent bus hangs.
  - Supports Multiple masters on the bus. This feature is only supported if Automatic Bus Clear is off.
  - Supports FastMode+.
  - I2C speed configurable via BIOS setup.
  - Up to 400kHz in normal mode, up to 800kHz in FastMode+.
  - IRQ configurable via BIOS setup.

- Watchdog
  - Supports up to three stages.
  - Timeout per stage: 1ms- 65sec, with a granularity of 1ms or 128ms - ~140min, with a granularity of 128ms.
  - Supports Standard and Window Mode. Window mode is an advanced watchdog feature for safety critical applications. It only allows triggering the Watchdog within a specific time window. This covers the case where software hangs in a loop within the watchdog trigger routine.
  - Stage events include NMI, Reset and IRQ (if enabled in BIOS setup).
  - Supports Auto Reload (allows to use the Watchdog as an event ticker).
  - Supports register lock to prevent the Watchdog from being disabled or its configuration being changed in safety critical applications.
  - Fully configurable via BIOS setup.
- COM Express GPIOs:
  - Supports eight bi-directional GPIOs.
  - Initial state (In/Out, High/Low, set during early POST) can be configured via BIOS setup.
  - Capable to generate IRQ events (if IRQ enabled in BIOS setup). For details on how to enable IRQ generation please refer to the DMEC Functional Specification.
  - Additional GPIO function configurable via BIOS setup:
    - GPIO4: GPIO or UART1 CTS
    - GPIO5: GPIO or WD Kick Input or UART1 RTS
    - GPIO6: GPIO or I2C2 CL
    - GPIO7: GPIO or I2C2 SDA.

Most common features are accessible through EApi function calls. EApi support and drivers for the DMEC device are available for Windows and Linux. For details on the DMEC register layout please refer to the DMEC Functional Specification which is available from DATA MODUL on request.

OnModule Memory

An 16MByte SPI in SO-8 package flash to store EFI and setup configuration is used on the eDM-COMB-BW6 design.
A 32kbit I2C EEPROM configured to address AE/AF is connected to the fast I2C bus of the Embedded Controller and also to the I2C interface of the COM Express connector.

Environmental Specification

The eDM-COMB-BW6 is able to be operated and stored under the following environmental conditions:

- Temperature (operating): 0°C ... +60°C (commercial grade)
  Extended temperature ranges on request.
- Temperature (storage): -20°C ... +80°C
- Humidity (operating): 5% ... 90% RH non-condensing
- Humidity (storage): 5% ... 95% RH non-condensing
- Tolerable air pressure: › 708 hPa (approx. altitude 2000m)

Power Supply

Input Voltage

- VCC: 12.0V ± 5%
- 5V_SBY: 5.0V ± 5%
- Modes: ATX Mode or VCC only without 5V_SBY

Specifications

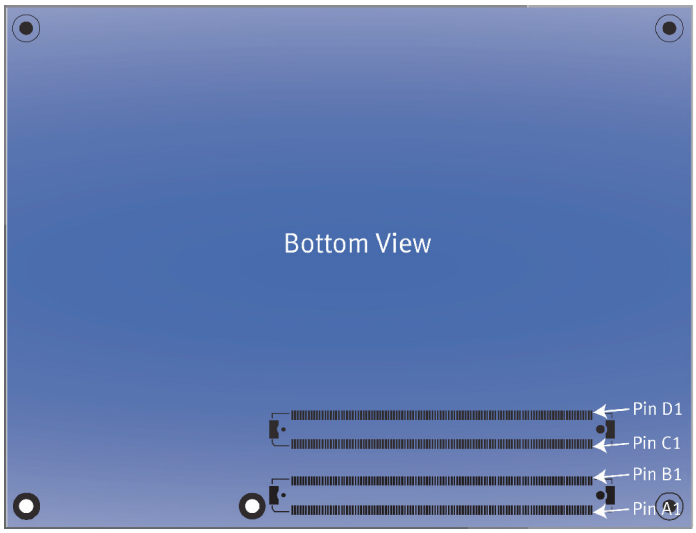
- Voltage Ripple: max. 100mV peak to peak 0 ... 20 MHz
- Rise Time: 0.1 ... 20ms from input voltage ‹ 10% nominal VCC
- Max. allowed Inrush Current 5V_SBY: 2A
  VCC: 10A

Power Features

- Reset Button Behavior
  Module resets immediately when reset button is pressed in S0 state.
  Module stays in reset condition when reset button is pressed and hold in any system state ‹ S0.
- Power Button Behavior
  Module stays in S5 state when switched on in ATX mode and wait for power button event.
  Module boots to S0 state when switched on in VCC-only mode.

COM Express Connectors & Signal Descriptions

Connector Location



General Signal Description

Type	Description
I/O-3.3	Bi-directional 3.3 V Input/Output-Signal
I/O-5T	Bi-directional 3.3 V Input/Output (5V Tolerance)
I/O-5	Bi-directional 5 V Input/Output-Signal
I3.3	3.3 V Input
I/OD	Bi-directional 3.3 V Input/Output Open Drain
I-5T	3.3 V Input (5V Tolerance)
OA	Output Analog
OD	Output Open Drain
O-1.8	1.8 V Output
O-3.3	3.3 V Output
O-5	5 V Output
DP-I/O	Differential Pair Input/Output
DP-I	Differential Pair Input
DP-O	Differential Pair Output
PU	Pull-Up Resistor
PD	Pull-Down Resistor
PWR	Power Connection

COM Express Connector Pinouts

The termination resistors in these tables are already mounted on the module.
Refer to the COM Express design guide for information about additional termination resistors.

Connector J1 Row A

Pin	Signal	Description	Type	Termination	Comment
A1	GND	Power Ground	PWR GND	-	-
A2	GBE0_MDI3-	Ethernet Media Dependent Interface 3-	DP-I/O	-	-
A3	GBE0_MDI3+	Ethernet Media Dependent Interface 3+	DP-I/O	-	-
A4	GBE0_LINK100#	Ethernet Speed LED	OD	-	can sink 100mA

A5	GBE0_LINK1000#	Ethernet Speed LED	OD	-	can sink 100mA
A6	GBE0_MDI2-	Ethernet Media Dependent Interface 2 -	DP-I/O	-	-
A7	GBE0_MDI2+	Ethernet Media Dependent Interface 2 +	DP-I/O	-	-
A8	GBE0_LINK#	LAN Link LED	OD	-	can sink 100mA
A9	GBE0_MDI1-	Ethernet Media Dependent Interface 1 -	DP-I/O	-	-
A10	GBE0_MDI1+	Ethernet Media Dependent Interface 1 +	DP-I/O	-	-
A11	GND	Power Ground	PWR GND	-	-
A12	GBE0_MDI0-	Ethernet Media Dependent Interface 0 -	DP-I/O	-	-
A13	GBE0_MDI0+	Ethernet Media Dependent Interface 0 +	DP-I/O	-	-
A14	GBE0_CTREF	Center Tab Reference Voltage	O	-	1µF capacitor to GND
A15	SUS_S3#	Suspend To RAM (or deeper) Indicator	0-3.3	PD 10k	-
A16	SATA0_TX+	SATA Transmit Pair 0 +	DP-O	-	-
A17	SATA0_TX-	SATA Transmit Pair 0 -	DP-O	-	-
A18	SUS_S4#	Suspend To Disk (or deeper) Indicator	0-3.3	PD 10k	-
A19	SATA0_RX+	SATA Receive Pair 0 +	DP-I	-	-
A20	SATA0_RX-	SATA Receive Pair 0 -	DP-I	-	-
A21	GND	Power Ground	PWR GND	-	-
A22	SATA2_TX+	SATA Transmit Pair 2 +	DP-O	-	-
A23	SATA2_TX-	SATA Transmit Pair 2 -	DP-O	-	-
A24	SUS_S5#	Soft Off Indicator	O-3.3	PD 10k	-
A25	SATA2_RX+	SATA Receive Pair 2 +	DP-I		
A26	SATA2_RX-	SATA Receive Pair 2 -	DP-I		
A27	BATLOW#	Battery Low	I-3.3	PU 10k 3.3V (S5)	assertion will prevent wake from S3-S5 state
A28	(S)ATA_ACT#	Serial ATA activity LED	OD-3.3	PU 10k 3.3V (S0)	can sink 200mA
A29	AC/HDA_SYNC	HD Audio Sync	O-3.3	PD 15k in PCH	-
A30	AC/HDA_RST#	HD Audio Reset	O-3.3	PD 15k in PCH	-
A31	GND	Power Ground	PWR GND	-	-
A32	AC/HDA_BITCLK	HD Audio Bit Clock Output	O-3.3	PD 15k in PCH	-
A33	AC/HDA_SDOUT	HD Audio Serial Data Out	O-3.3	PD 15k in PCH	-
A34	BIOS_DIS0#	BIOS Selection Strap 0	I-3.3	PU 10k 3.3V (SPI)	-
A35	THRMTRIP#	Thermal Trip	O-3.3	PU 10k 3.3V (S0)	do not use as this signal, because there is no difference between regular and over-temperature shutdown
A36	USB6-	USB 2.0 Data Pair Port 6 -	DP-I/O	PD in PCH	-
A37	USB6+	USB 2.0 Data Pair Port 6 +	DP-I/O	PD in PCH	-
A38	USB_6_7_OC#	USB Overcurrent Indicator Port 6/7	I-3.3	PU 10k 3.3V (S5)	-
A39	USB4-	USB 2.0 Data Pair Port 4 -	DP-I/O	PD in PCH	-
A40	USB4+	USB 2.0 Data Pair Port 4 +	DP-I/O	PD in PCH	-
A41	GND	Power Ground	PWR GND	-	-
A42	USB2-	USB 2.0 Data Pair Port 2 -	DP-I/O	PD in PCH	-
A43	USB2+	USB 2.0 Data Pair Port 2 +	DP-I/O	PD in PCH	-
A44	USB_2_3_OC#	USB Overcurrent Indicator Port 2/3	I-3.3	PU 10k 3.3V (S5)	-
A45	USB0-	USB 2.0 Data Pair Port 0 -	DP-I/O	PD in PCH	-
A46	USB0+	USB 2.0 Data Pair Port 0 +	DP-I/O	PD in PCH	-
A47	VCC_RTC	Real-Time Clock Circuit Power Input	PWR 3V	-	voltage range 2.7-3.47V
A48	EXCD0_PERST#	Express Card Reset Port 0	O-3.3	-	-
A49	EXCD0_CPPE#	Express Card Capable Card Request Port 0	I-3.3	PU 10k 3.3V (S0)	-

A50	LPC_SERIRQ	Serial Interrupt Request	I/OD-3.3	PU 8k25k 3.3V (S0)	-
A51	GND	Power Ground	PWR GND	-	-
A52	PCIE_TX5+	PCI Express Lane 5 Transmit +	DP-O	-	-
A53	PCIE_TX5-	PCI Express Lane 5 Transmit -	DP-O	-	-
A54	GPI0	General Purpose Input 0	I-3.3	PU 10k 3.3V (S0)	-
A55	PCIE_TX4+	PCI Express Lane 4 Transmit +	DP-O	-	-
A56	PCIE_TX4-	PCI Express Lane 4 Transmit -	DP-O	-	-
A57	GND	Power Ground	PWR GND	-	-
A58	PCIE_TX3+	PCI Express Lane 3 Transmit +	DP-O	-	-
A59	PCIE_TX3-	PCI Express Lane 3 Transmit -	DP-O	-	-
A60	GND	Power Ground	PWR GND	-	-
A61	PCIE_TX2+	PCI Express Lane 2 Transmit +	DP-O	-	-
A62	PCIE_TX2-	PCI Express Lane 2 Transmit -	DP-O	-	-
A63	GPI1	General Purpose Input 1	I-3.3	PU 10k 3.3V (S0)	-
A64	PCIE_TX1+	PCI Express Lane 1 Transmit +	DP-O	-	-
A65	PCIE_TX1-	PCI Express Lane 1 Transmit -	DP-O	-	-
A66	GND	Power Ground	PWR GND	-	-
A67	GPI2	General Purpose Input 2	I-3.3	PU 10k 3.3V (S0)	-
A68	PCIE_TX0+	PCI Express Lane 0 Transmit +	DP-O	-	-
A69	PCIE_TX0-	PCI Express Lane 0 Transmit -	DP-O	-	-
A70	GND	Power Ground	PWR GND	-	-
A71	LVDS_A0+/eDP_TX2+	LVDS Channel A Data0 + (shared eDP TX2+)	DP-O	-	configuration as eDP_TX0+ in customized article version possible
A72	LVDS_A0-/eDP_TX2-	LVDS Channel A Data0 - (shared eDP TX2-)	DP-O	-	configuration as eDP_TX0- in customized article version possible
A73	LVDS_A1+/eDP_TX1+	LVDS Channel A Data0 - (shared eDP TX2-)	DP-O	-	configuration as eDP_TX1+ in customized article version possible
A74	LVDS_A1-/eDP_TX1-	LVDS Channel A Data1 - (shared eDP TX1-)	DP-O	-	configuration as eDP_TX1- in customized article version possible
A75	LVDS_A2+/eDP_TX0+	LVDS Channel A Data2 + (shared eDP TX0+)	DP-O	-	configuration as eDP_TX2+ in customized article version possible
A76	LVDS_A2-/eDP_TX0-	LVDS Channel A Data2 + (shared eDP TX0-)	DP-O	-	configuration as eDP_TX2- in customized article version possible
A77	LVDS/eDP_VDD_EN	LVDS (or eDP) Panel Power Control	O-3.3	PD 100k	configuration as eDP_VDD_EN in customized article version possible
A78	LVDS_A3+	LVDS Channel A Data3 +	DP-O	-	-
A79	LVDS_A3-	LVDS Channel A Data3 -	DP-O	-	-
A80	GND	Power Ground	PWR GND	-	-
A81	LVDS_A_CK+/eDP_TX3+	LVDS Channel A Clock (shared eDP TX3+)	DP-O		configuration as eDP_TX3+ in customized article version possible
A82	LVDS_A_CK-/eDP_TX3-	LVDS Channel A Clock - (shared eDP TX3-)	DP-O	-	configuration as eDP_TX3- in customized article version possible
A83	LVDS_I2C_CK/eDP_AUX+	LVDS Data Channel Data (shared eDP AUX-)	I/O-3.3	PU 2k4 3.3V (S0)	configuration as eDP_AUX+ in customized article version possible

A84	LVDS_I2C_DAT/eDP_AUX-	LVDS Data Channel Data (shared eDP AUX-)	I/O-3.3	PU 2k4 3.3V (S0)	configuration as eDP_AUX- in customized article version possible
A85	GPI3	General Purpose Input 3	I-3.3	PU 10k 3.3V (S0)	-
A86	RSVD	Reserved for future use	nc	-	-
A87	RSVD/eDP_HPD	Reserved (shared eDP hot plug detection)	nc/I-3.3	100k PD (opt)	configuration as eDP_HPD in customized article version possible
A88	PCIE_CLK_REF+	Reference PCI Express Clock +	DP-O	-	-
A89	PCIE_CLK_REF-	Reference PCI Express Clock -	DP-O	-	-
A90	GND	Power Ground	PWR GND	-	-
A91	SPI_POWER	3.3V Power Output Pin for external SPI flash	O-3.3	-	-
A92	SPI_MISO	SPI Master IN Slave OUT	I-3.3	PU 20k in PCH	All SPI signals are tri-stated with 20k ohm PCH internal weak pull-up until reset is deasserted.
A93	GPO0	General Purpose Output 0	O-3.3	PD 10k	-
A94	SPI_CLK	SPI Clock	O-3.3	PU 20k in PCH	All SPI signals are tri-stated with 20k ohm PCH internal weak pull-up until reset is deasserted.
A95	SPI_MOSI	SPI Master Out Slave In	O-3.3	PU 20k in PCH	All SPI signals are tri-stated with 20k ohm PCH internal weak pull-up until reset is deasserted.
A96	TPM_PP	No connect/TPM Physical Presence	nc/I-3.3	100k PD (opt)	configuration as TPM_PP in customized article version possible
A97	TYPE10#	No connect for TYPE 6 module	nc	-	-
A98	SER0_TX	Serial Port 0 TXD	O-3.3	-	20V protection circuit implemented on module, PD on carrier board needed for proper operation.
A99	SER0_RX	Serial Port 0 RXD	I-5T	PU 47k 3.3V (S0)	20V protection circuit implemented on module
A100	GND	Power Ground	PWR GND	-	-
A101	SER1_TX	Serial Port 1 RXD	O-3.3	-	20V protection circuit implemented on module, PD on carrier board needed for proper operation.
A102	SER1_RX	Serial Port 1 RXD	I-5T	PU 47k 3.3V (S0)	20V protection circuit implemented on module
A103	LID#	LID Switch Input	I-3.3	PU 47k 3.3V (S5)	20V protection circuit implemented on module
A104	VCC_12V	Main Input Voltage	PWR 12V	-	-
A105	VCC_12V	Main Input Voltage	PWR 12V	-	-
A106	VCC_12V	Main Input Voltage	PWR 12V	-	-
A107	VCC_12V	Main Input Voltage	PWR 12V	-	-
A108	VCC_12V	Main Input Voltage	PWR 12V	-	-
A109	VCC_12V	Main Input Voltage	PWR 12V	-	-
A110	GND	Power Ground	PWR GND	-	-

Connector J1 Row B

Pin	Signal	Description	Type	Termination	Comment
B1	GND	Power Ground	PWR GND	-	-
B2	GBE0_ACT	Ethernet Activity LED	OD	-	can sink 100mA
B3	LPC_FRAME#	LPC Frame Indicator	O-3.3	-	-
B4	LPC_AD0	LPC Multiplexed Command, Address & Data 0	I/O-3.3	PU 20k in PCH	-

B5	LPC_AD1	LPC Multiplexed Command, Address & Data 1	I/O-3.3	PU 20k in PCH	-
B6	LPC_AD2	LPC Multiplexed Command, Address & Data 2	I/O-3.3	PU 20k in PCH	-
B7	LPC_AD3	LPC Multiplexed Command, Address & Data 3	I/O-3.3	PU 20k in PCH	-
B8	LPC_DRQ0#	LPC Serial DMA/Master Request 0	I-3.3	PU 20k in PCH	-
B9	LPC_DRQ1#	LPC Serial DMA/Master Request 1	I-3.3	PU 20k in PCH	-
B10	LPC_CLK	33MHz LPC clock	O-3.3	PU 20k in PCH	-
B11	GND	Power Ground	PWR GND	-	-
B12	PWRBTN#	Power Button	I-3.3	PU 10k 3.3V (S5)	-
B13	SMB_CK	SMBUS Clock	O-3.3	PU 3k3 3.3V (S5)	-
B14	SMB_DAT	SMBUS Data	I/O-3.3	PU 3k3 3.3V (S5)	-
B15	SMB_ALERT#	SMBUS Alert	I/O-3.3	PU 10k 3.3V (S5)	-
B16	SATA1_TX+	SATA 1 Transmit Pair +	DP-O	-	-
B17	SATA1_TX-	SATA 1 Transmit Pair -	DP-O	-	-
B18	SUS_STAT#	Suspend Status	O-3.3	-	-
B19	SATA1_RX+	SATA 1 Receive Pair +	DP-I	-	-
B20	SATA1_RX-	SATA 1 Receive Pair -	DP-I	-	-
B21	GND	Power Ground	PWR GND	-	-
B22	SATA3_TX+	SATA 3 Transmit Pair +	DP-O	-	-
B23	SATA3_TX-	SATA 3 Transmit Pair -	DP-O	-	-
B24	PWR_OK	Power OK	I-5T	PU 500k 3.3V	-
B25	SATA3_RX+	SATA 3 Receive Pair +	DP-I	-	-
B26	SATA3_RX-	SATA 3 Receive Pair -	DP-I	-	-
B27	WDT	Watch Dog Time-Out event	O-3.3	-	-
B28	AC/HDA_SDIN2	HD Audio Serial Data In 2	I-3.3	PD 15k in PCH	-
B29	AC/HDA_SDIN1	HD Audio Serial Data In 1	I-3.3	PD 15k in PCH	-
B30	AC/HDA_SDIN0	HD Audio Serial Data In 0	I-3.3	PD 15k in PCH	-
B31	GND	Power Ground	PWR GND	-	-
B32	SPKR	Speaker	O-3.3	PD 20k in PCH	-
B33	I2C_CK	I2C Clock	O-3.3	PU 2k4 3.3V (S5)	-
B34	I2C_DAT	I2C Data	I/O-3.3	PU 2k4 3.3V (S5)	-
B35	THRM#	Over Temperature Input	I-3.3	PU 10k 3.3V (S0)	-
B36	USB7-	USB 2.0 Data Pair Port 7 -	DP-I/O	PD in PCH	-
B37	USB7+	USB 2.0 Data Pair Port 7 +	DP-I/O	PD in PCH	-
B38	USB_4_5_OC#	USB Overcurrent Indicator Port 4/5	I-3.3	PU 10k 3.3V (S5)	-
B39	USB5-	USB 2.0 Data Pair Port 5 -	DP-I/O	PD in PCH	-
B40	USB5+	USB 2.0 Data Pair Port 5 +	DP-I/O	PD in PCH	-
B41	GND	Power Ground	PWR GND	-	-
B42	USB3-	USB 2.0 Data Pair Port 3 -	DP-I/O	PD in PCH	-
B43	USB3+	USB 2.0 Data Pair Port 3 +	DP-I/O	PD in PCH	-
B44	USB_0_1_OC#	USB Overcurrent Indicator Port 0/1	I-3.3	PU 10k 3.3V (S5)	-
B45	USB1-	USB 2.0 Data Pair Port 1 -	DP-I/O	PD in PCH	-
B46	USB1+	USB 2.0 Data Pair Port 1 +	DP-I/O	PD in PCH	-
B47	EXCD1_PERST#	Express Card Reset Port 1	O-3.3	-	-

B48	EXCD1_CPPE#	Express Card Capable Card Request Port 1	I-3.3	PU 10k 3.3V (S0)	-
B49	SYS_RESET#	Reset Button Input	O-3.3	PU 10k 3.3V (S0)	-
B50	CB_RESET#	Carrier Board Reset	O-3.3	-	-
B51	GND	Power Ground	PWR GND	-	-
B52	PCIE_RX5+	PCI Express Lane 5 Receive +	DP-I	-	-
B53	PCIE_RX5-	PCI Express Lane 5 Receive -	DP-I	-	-
B54	GPO1	General Purpose Output 1	O-3.3	PD 10k	-
B55	PCIE_RX4+	PCI Express Lane 4 Receive +	DP-I	-	-
B56	PCIE_RX4-	PCI Express Lane 4 Receive -	DP-I	-	-
B57	GPO1	General Purpose Output 2	O-3.3	PD 10k	-
B58	PCIE_RX3+	PCI Express Lane 3 Receive +	DP-I	-	-
B59	PCIE_RX3-	PCI Express Lane 3 Receive -	DP-I	-	-
B60	GND	Power Ground	PWR GND	-	-
B61	PCIE_RX2+	PCI Express Lane 2 Receive +	DP-I	-	-
B62	PCIE_RX2-	PCI Express Lane 2 Receive -	DP-I	-	-
B63	GPO3	General Purpose Output 3	O-3.3	PD 10k	-
B64	PCIE_RX1+	PCI Express Lane 1 Receive +	DP-I	-	-
B65	PCIE_RX1-	PCI Express Lane 1 Receive -	DP-I	-	-
B66	WAKE0#	PCI Express Wake Event	I-3.3	PU 10k 3.3V (S5)	-
B67	WAKE1#	General Purpose Wake Event	I-3.3	PU 10k 3.3V (S5)	-
B68	PCIE_RX0+	PCI Express Lane 0 Receive +	DP-I	-	-
B69	PCIE_RX0-	PCI Express Lane 0 Receive -	DP-I	-	-
B70	GND	Power Ground	PWR GND	-	-
B71	LVDS_B0+	LVDS Channel B Data0 +	DP-O	-	-
B72	LVDS_B0-	LVDS Channel B Data0 -	DP-O	-	-
B73	LVDS_B1+	LVDS Channel B Data1 +	DP-O	-	-
B74	LVDS_B1-	LVDS Channel B Data1 -	DP-O	-	-
B75	LVDS_B2+	LVDS Channel B Data2 +	DP-O	-	-
B76	LVDS_B2-	LVDS Channel B Data2 -	DP-O	-	-
B77	LVDS_B4+	LVDS Channel B Data4 +	DP-O	-	-
B78	LVDS_B4-	LVDS Channel B Data4 -	DP-O	-	-
B79	LVDS/eDP_BKLT_EN	Panel Backlight On	O-3.3	PD 100k	configuration as eDP_BKLT_EN in customized article version possible
B80	GND	Power Ground	PWR GND	-	-
B81	LVDS_B_CK+	LVDS Channel B Clock +	DP-O	-	-
B82	LVDS_B_CK-	LVDS Channel B Clock -	DP-O	-	-
B83	LVDS_BKLT_CTRL	Backlight Brightness Control	O-3.3	-	-
B84	VCC_5V_SBY	5V Standby	PWR 5V (S5)	-	optional (not necessary in single supply mode)
B85	VCC_5V_SBY	5V Standby	PWR 5V (S5)	-	optional (not necessary in single supply mode)
B86	VCC_5V_SBY	5V Standby	PWR 5V (S5)	-	optional (not necessary in single supply mode)
B87	VCC_5V_SBY	5V Standby	PWR 5V (S5)	-	optional (not necessary in single supply mode)
B88	BIOS_DIS1#	BIOS Selection Strap 1	I-3.3	PU 10k 3.3V (SPI)	-
B89	VGA_RED	Red Analog Video Output	OA	PD 150R	-
B90	GND	Power Ground	PWR GND	-	-
B91	VGA_GRN	Green Analog Video Output	OA	PD 150R	-

B92	VGA_BLU	Blue Analog Video Output	OA	PD 150R	-
B93	VGA_HSYNC	VGA Horizontal Synchronisation	O-3.3	-	-
B94	VGA_VSYNC	VGA Vertical Synchronization	O-3.3	-	-
B95	VGA_I2C_CK	VGA Data Channel Clock	I/O-3.3	PU 1k 3.3V (S0)	5V tolerant
B96	VGA_I2C_DAT	VGA Data Channel Data	I/O-3.3	PU 1k 3.3V (S0)	5V tolerant
B97	SPI_CS#	SPI Chip Select	O-3.3	-	-
B98	RSVD	Reserved for future use	nc	-	-
B99	RSVD	Reserved for future use	nc	-	-
B100	GND	Power Ground	PWR GND	-	-
B101	FAN_PWMOUT	Fan PWM Output	O-3.3	-	20V protection circuit implemented on module, PD on carrier board needed for proper operation.
B102	FAN_TACHIN	Fan Tach Input	I-3.3	PU 47k 3.3V (S0)	20V protection circuit implemented on module
B103	SLEEP#	Sleep Button Input	I-3.3	PU 47k 3.3V (S5)	20V protection circuit implemented on module
B104	VCC_12V	Main Input Voltage	PWR 12V	-	-
B105	VCC_12V	Main Input Voltage	PWR 12V	-	-
B106	VCC_12V	Main Input Voltage	PWR 12V	-	-
B107	VCC_12V	Main Input Voltage	PWR 12V	-	-
B108	VCC_12V	Main Input Voltage	PWR 12V	-	-
B109	VCC_12V	Main Input Voltage	PWR 12V	-	-
B110	GND	Power Ground	PWR GND	-	-

Connector J1 Row C

Pin	Signal	Description	Type	Termination	Comment
C1	GND	Power Ground	PWR GND	-	-
C2	GND	Power Ground	PWR GND	-	-
C3	USB_SSRX0-	USB Super Speed Receive Port 0 -	DP-I	-	-
C4	USB_SSRX0+	USB Super Speed Receive Port 0 +	DP-I	-	-
C5	GND	Power Ground	PWR GND	-	-
C6	USB_SSRX1-	USB Super Speed Receive Port 1 -	DP-I	-	-
C7	USB_SSRX1+	USB Super Speed Receive Port 1 +	DP-I	-	-
C8	GND	Power Ground	PWR GND	-	-
C9	USB_SSRX2-	USB Super Speed Receive Port 2 -	DP-I	-	-
C10	USB_SSRX2+	USB Super Speed Receive Port 2 +	DP-I	-	-
C11	GND	Power Ground	PWR GND	-	-
C12	USB_SSRX3-	USB Super Speed Receive Port 3 -	DP-I	-	-
C13	USB_SSRX3+	USB Super Speed Receive Port 3+	DP-I	-	-
C14	GND	Power Ground	PWR GND	-	-
C15	DDI1_PAIR6+	No connect	nc	-	not supported by Intel's PCH
C16	DDI1_PAIR6-	No connect	nc	-	not supported by Intel's PCH
C17	RSVD	Reserved for future use	nc	-	-
C18	RSVD	Reserved for future use	nc	-	-
C19	PCIE_RX6+	PCI Express Lane 6 Receive +	DP-I	-	-
C20	PCIE_RX6-	PCI Express Lane 6 Receive -	DP-I	-	-
C21	GND	Power Ground	PWR GND	-	-
C22	PCIE_RX7+	No connect/PCI Express Lane 7 Receive +	nc/DP-I	-	only optional in customized article version possible, if no GbEthernet is stuffed

C23	PCIE_RX7-	No connect/PCI Express Lane 7 Receive -	nc/DP-I	-	only optional in customized article version possible, if no GbEthernet is stuffed
C24	DDI1_HPD	DDI1 Hotplug Detect	I-3.3	PD 100k	-
C25	DDI1_PAIR4+	No connect	nc	-	not supported by Intel's PCH
C26	DDI1_PAIR4-	No connect	nc	-	not supported by Intel's PCH
C27	RSVD	Reserved for future use	nc	-	-
C28	RSVD	Reserved for future use	nc	-	-
C29	DDI1_PAIR5+	No connect	DP-I	-	not supported by Intel's PCH
C30	DDI1_PAIR5-	No connect	DP-I	-	not supported by Intel's PCH
C31	GND	Power Ground	PWR GND	-	-
C32	DDI2_CTRLCLK_AUX+	Multiplexed DDI2 Data Channel Clock & AUX +	I/O-3.3	PD 100k	2k21 PU (S0) when DDI2_DDC_AUX_SEL is high
C33	DDI2_CTRLCLK_AUX-	Multiplexed DDI2 Data Channel Clock & AUX -	I/O-3.3	PU 100k (S0)	2k21 PU (S0) when DDI2_DDC_AUX_SEL is high
C34	DDI2_DDC_AUX_SEL	DDI2 DDC/AUX Select	I-3.3	PD 1MEG	-
C35	RSVD	Reserved for future use	nc	-	-
C36	DDI3_CTRLCLK_AUX+	Multiplexed DDI3 Data Channel Clock & AUX +	I/O-3.3	PD 100k	2k21 PU (S0) when DDI3_DDC_AUX_SEL is high
C37	DDI3_CTRLDATA_AUX-	Multiplexed DDI3 Data Channel Clock & AUX -	I/O-3.3	PU 100k (S0)	2k21 PU (S0) when DDI3_DDC_AUX_SEL is high
C38	DDI3_DDC_AUX_SEL	DDI3 DDC/AUX Select	I-3.3	PD 1MEG	-
C39	DDI3_PAIR0+	DDI3 Pair 0 +	DP-O	-	-
C40	DDI3_PAIR0-	DDI3 Pair 0 -	DP-O	-	-
C41	GND	Power Ground	PWR GND	-	-
C42	DDI3_PAIR1+	DDI3 Pair 1 +	DP-O	-	-
C43	DDI3_PAIR1-	DDI3 Pair 1 -	DP-O	-	-
C44	DDI3_HPD	DDI3 Hotplug Detect	I-3.3	PD 100k	-
C45	RSVD	Reserved for future use	nc	-	-
C46	DDI3_PAIR2+	DDI3 Pair 2 +	DP-O	-	-
C47	DDI3_PAIR2-	DDI3 Pair 2 -	DP-O	-	-
C48	RSVD	Reserved for future use	nc	-	-
C49	DDI3_PAIR3+	DDI3 Pair 3 +	DP-O	-	-
C50	DDI3_PAIR3-	DDI3 Pair 3 -	DP-O	-	-
C51	GND	Power Ground	PWR GND	-	-
C52	PEG_RX0+	PCI Express Graphics Lane 0 Receive +	DP-I	-	-
C53	PEG_RX0-	PCI Express Graphics Lane 0 Receive -	DP-I	-	-
C54	TYPE0#	No Connect for TYPE 6 module	nc	-	-
C55	PEG_RX1+	PCI Express Graphics Lane 1 Receive +	DP-I	-	-
C56	PEG_RX1-	PCI Express Graphics Lane 1 Receive -	DP-I	-	-
C57	TYPE1#	No Connect for TYPE 6 module	nc	-	-
C58	PEG_RX2+	PCI Express Graphics Lane 2 Receive +	DP-I	-	-
C59	PEG_RX2-	PCI Express Graphics Lane 2 Receive -	DP-I	-	-
C60	GND	Power Ground	PWR GND	-	-
C61	PEG_RX3+	PCI Express Graphics Lane 3 Receive +	DP-I	-	-
C62	PEG_RX3-	PCI Express Graphics Lane 3 Receive -	DP-I	-	-
C63	RSVD	Reserved for future use	nc	-	-
C64	RSVD	Reserved for future use	nc	-	-
C65	PEG_RX4+	PCI Express Graphics Lane 4 Receive +	DP-I	-	-
C66	PEG_RX4-	PCI Express Graphics Lane 4 Receive -	DP-I	-	-
C67	RSVD	Reserved for future use	nc	-	-
C68	PEG_RX5+	PCI Express Graphics Lane 5 Receive +	DP-I	-	-
C69	PEG_RX5-	PCI Express Graphics Lane 5 Receive -	DP-I	-	-

C70	GND	Power Ground	PWR GND	-	-
C71	PEG_RX6+	PCI Express Graphics Lane 6 Receive +	DP-I	-	-
C72	PEG_RX6-	PCI Express Graphics Lane 6 Receive -	DP-I	-	-
C73	GND	Power Ground	PWR GND	-	-
C74	PEG_RX7+	PCI Express Graphics Lane 7 Receive +	DP-I	-	-
C75	PEG_RX7-	PCI Express Graphics Lane 7 Receive -	DP-I	-	-
C76	GND	Power Ground	nc	-	-
C77	RSVD	Reserved for future use	nc	-	-
C78	PEG_RX8+	PCI Express Graphics Lane 8 Receive +	DP-I	-	-
C79	PEG_RX8-	PCI Express Graphics Lane 8 Receive -	DP-I	-	-
C80	GND	Power Ground	PWR GND	-	-
C81	PEG_RX9+	PCI Express Graphics Lane 9 Receive +	DP-I	-	-
C82	PEG_RX9-	PCI Express Graphics Lane 9 Receive -	DP-I	-	-
C83	RSVD	Reserved for future use	nc	-	-
C84	GND	Power Ground	PWR GND	-	-
C85	PEG_RX10+	PCI Express Graphics Lane 10 Receive +	DP-I	-	-
C86	PEG_RX10-	PCI Express Graphics Lane 10 Receive -	DP-I	-	-
C87	GND	Power Ground	PWR GND	-	-
C88	PEG_RX11+	PCI Express Graphics Lane 11 Receive +	DP-I	-	-
C89	PEG_RX11-	PCI Express Graphics Lane 11 Receive -	DP-I	-	-
C90	GND	Power Ground	PWR GND	-	-
C91	PEG_RX12+	PCI Express Graphics Lane 12 Receive +	DP-I	-	-
C92	PEG_RX12-	PCI Express Graphics Lane 12 Receive -	DP-I	-	-
C93	GND	Power Ground	PWR GND	-	-
C94	PEG_RX13+	PCI Express Graphics Lane 13 Receive +	DP-I	-	-
C95	PEG_RX13-	PCI Express Graphics Lane 13 Receive -	DP-I	-	-
C96	GND	Power Ground	PWR GND	-	-
C97	RSVD	Reserved for future use	nc	-	-
C98	PEG_RX14+	PCI Express Graphics Lane 14 Receive +	DP-I	-	-
C99	PEG_RX14-	PCI Express Graphics Lane 14 Receive -	DP-I	-	-
C100	GND	Power Ground	PWR GND	-	-
C101	PEG_RX15+	PCI Express Graphics Lane 15 Receive +	DP-I	-	-
C102	PEG_RX15-	PCI Express Graphics Lane 15 Receive -	DP-I	-	-
C103	GND	Power Ground	PWR GND	-	-
C104	VCC_12V	Main Input Voltage	PWR 12V	-	-
C105	VCC_12V	Main Input Voltage	PWR 12V	-	-
C106	VCC_12V	Main Input Voltage	PWR 12V	-	-
C107	VCC_12V	Main Input Voltage	PWR 12V	-	-
C108	VCC_12V	Main Input Voltage	PWR 12V	-	-
C109	VCC_12V	Main Input Voltage	PWR 12V	-	-
C110	GND	Power Ground	PWR GND	-	-

Connector J1 Row D

Pin	Signal	Description	Type	Termination	Comment
D1	GND	Power Ground	PWR GND	-	-
D2	GND	Power Ground	PWR GND	-	-
D3	USB_SSTX0-	USB Super Speed Transmit Port 0 -	DP-O	-	-
D4	USB_SSTX0+	USB Super Speed Transmit Port 0 +	DP-O	-	-
D5	GND	Power Ground	PWR GND	-	-
D6	USB_SSTX1-	USB Super Speed Transmit Port 1 -	DP-O	-	-
D7	USB_SSTX1+	USB Super Speed Transmit Port 1 +	DP-O	-	-

D8	GND	Power Ground	PWR GND	-	-
D9	USB_SSTX2-	USB Super Speed Transmit Port 2 -	DP-O	-	-
D10	USB_SSTX2+	USB Super Speed Transmit Port 2+	DP-O	-	-
D11	GND	Power Ground	PWR GND	-	-
D12	USB_SSTX3-	USB Super Speed Transmit Port 3 -	DP-O	-	-
D13	USB_SSTX3+	USB Super Speed Transmit Port 3 +	DP-O	-	-
D14	GND	Power Ground	PWR GND	-	-
D15	DDI1_CTRLCLK_AUX+	Multiplexed DDI1 Data Channel Clock & AUX +	I/O-3.3	PD 100k	2k21 PU (S0) when DDI1_DDC_AUX_SEL is high
D16	DDI1_CTRLDATA_AUX-	Multiplexed DDI1 Data Channel Clock & AUX -	I/O-3.3	PU 100k (S0)	2k21 PU (S0) when DDI1_DDC_AUX_SEL is high
D17	RSVD	Reserved for future use	nc	-	-
D18	RSVD	Reserved for future use	nc	-	-
D19	PCIE_TX6+	PCI Express Lane 6 Transmit +	DP-O	-	-
D20	PCIE_TX6-	PCI Express Lane 6 Transmit -	DP-O	-	-
D21	GND	Power Ground	PWR GND	-	-
D22	PCIE_TX7+	No connect/PCI Express Lane 7 Transmit +	nc/DP-O	-	-
D23	PCIE_TX7-	No connect/PCI Express Lane 7 Transmit -	nc/DP-O	-	-
D24	RSVD	Reserved for future use	nc	-	-
D25	RSVD	Reserved for future use	nc	-	-
D26	DDI1_PAIR0+	DDI1 Pair 0 +	DP-O	-	-
D27	DDI1_PAIR0-	DDI1 Pair 0 -	DP-O	-	-
D28	RSVD	Reserved for future use	nc	-	-
D29	DDI1_PAIR1+	DDI1 Pair 1 +	DP-O	-	-
D30	DDI1_PAIR1-	DDI1 Pair 1 -	DP-O	-	-
D31	GND	Power Ground	PWR GND	-	-
D32	DDI1_PAIR2+	DDI1 Pair 2 +	DP-O	-	-
D33	DDI1_PAIR2-	DDI1 Pair 2 -	DP-O	-	-
D34	DDI1_DDC_AUX_SEL	DDI1 DDC/AUX Select	I-3.3	PD 1 MEG	-
D35	RSVD	Reserved for future use	nc	-	-
D36	DDI1_PAIR3+	DDI1 Pair 3 +	DP-O	-	-
D37	DDI1_PAIR3-	DDI1 Pair 3-	DP-O	-	-
D38	RSVD	Reserved for future use	nc	-	-
D39	DDI2_PAIR0+	DDI2 Pair 0 +	DP-O	-	-
D40	DDI2_PAIR0-	DDI2 Pair 0 -	DP-O	-	-
D41	GND	Power Ground	PWR GND	-	-
D42	DDI2_PAIR1+	DDI2 Pair 1 +	DP-O	-	-
D43	DDI2_PAIR1-	DDI2 Pair 1 -	DP-O	-	-
D44	DDI2_HPD	DDI2 Hotplug Detect	I-3.3	PD 100k	-
D45	RSVD	Reserved for future use	nc	-	-
D46	DDI2_PAIR2+	DDI2 Pair 2 +	DP-O	-	-
D47	DDI2_PAIR2-	DDI2 Pair 2 -	DP-O	-	-
D48	RSVD	Reserved for future use	nc	-	-
D49	DDI2_PAIR3+	DDI2 Pair 3 +	DP-O	-	-
D50	DDI2_PAIR3-	DDI2 Pair 3-	DP-O	-	-
D51	GND	Power Ground	PWR GND	-	
D52	PEG_TX0+	PCI Express Graphics Lane 0 Transmit +	DP-O	-	-
D53	PEG_TX0-	PCI Express Graphics Lane 0 Transmit -	DP-O	-	-
D54	PEG_Lane_RV#	PCI Express Graphics Lane Reversal	I-3.3	PU 10k 3.3V (S0)	-
D55	PEG_TX1+	PCI Express Graphics Lane 1 Transmit +	DP-O	-	-
D56	PEG_TX1-	PCI Express Graphics Lane 1 Transmit -	DP-O	-	-

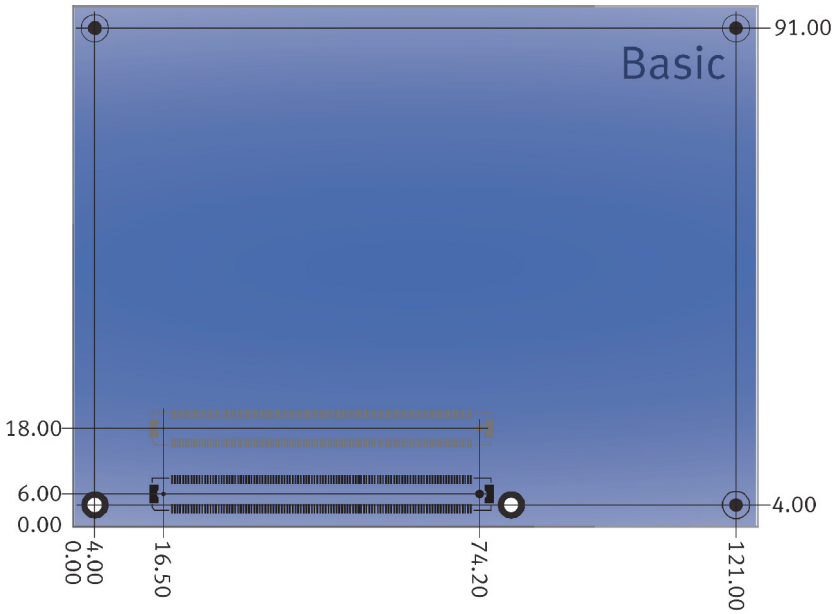
D57	TYPE2#	Connected to GND for TYPE 6 module	PWR GND	-	-
D58	PEG_TX2+	PCI Express Graphics Lane 2 Transmit +	DP-O	-	-
D59	PEG_TX2-	PCI Express Graphics Lane 2 Transmit -	DP-O	-	-
D60	GND	Power Ground	PWR GND	-	-
D61	PEG_TX3+	PCI Express Graphics Lane 3 Transmit +	DP-O	-	-
D62	PEG_TX3-	PCI Express Graphics Lane 3 Transmit -	DP-O	-	-
D63	RSVD	Reserved for future use	nc	-	-
D64	RSVD	Reserved for future use	nc	-	-
D65	PEG_TX4+	PCI Express Graphics Lane 4 Transmit +	DP-O	-	-
D66	PEG_TX4-	PCI Express Graphics Lane 4 Transmit -	DP-O	-	-
D67	GND	Power Ground	PWR GND	-	-
D68	PEG_TX5+	PCI Express Graphics Lane 5 Transmit +	DP-O	-	-
D69	PEG_TX5-	PCI Express Graphics Lane 5 Transmit -	DP-O	-	-
D70	GND	Power Ground	PWR GND	-	-
D71	PEG_TX6+	PCI Express Graphics Lane 6 Transmit +	DP-O	-	-
D72	PEG_TX6-	PCI Express Graphics Lane 6 Transmit -	DP-O	-	-
D73	GND	Power Ground	PWR GND	-	-
D74	PEG_TX7+	PCI Express Graphics Lane 7 Transmit +	DP-O	-	-
D75	PEG_TX7-	PCI Express Graphics Lane 7 Transmit -	DP-O	-	-
D76	GND	Power Ground	PWR GND	-	-
D77	RSVD	Reserved for future use	nc	-	-
D78	PEG_TX8+	PCI Express Graphics Lane 8 Transmit +	DP-O	-	-
D79	PEG_TX8-	PCI Express Graphics Lane 8 Transmit -	DP-O	-	-
D80	GND	Power Ground	PWR GND	-	-
D81	PEG_TX9+	PCI Express Graphics Lane 9 Transmit +	DP-O	-	-
D82	PEG_TX9-	PCI Express Graphics Lane 9 Transmit -	DP-O	-	-
D83	RSVD	Reserved for future use	nc	-	-
D84	GND	Power Ground	PWR GND	-	-
D85	PEG_TX10+	PCI Express Graphics Lane 10 Transmit +	DP-O	-	-
D86	PEG_TX10-	PCI Express Graphics Lane 10 Transmit -	DP-O	-	-
D87	GND	Power Ground	PWR GND	-	-
D88	PEG_TX11+	PCI Express Graphics Lane 11 Transmit +	DP-O	-	-
D89	PEG_TX11-	PCI Express Graphics Lane 11 Transmit -	DP-O	-	-
D90	GND	Power Ground	PWR GND	-	-
D91	PEG_TX12+	PCI Express Graphics Lane 12 Transmit +	DP-O	-	-
D92	PEG_TX12-	PCI Express Graphics Lane 12 Transmit -	DP-O	-	-
D93	GND	Power Ground	PWR GND	-	-
D94	PEG_TX13+	PCI Express Graphics Lane 13 Transmit +	DP-O	-	-
D95	PEG_TX13-	PCI Express Graphics Lane 13 Transmit -	DP-O	-	-
D96	GND	Power Ground	PWR GND	-	-
D97	RSVD	Reserved for future use	nc	-	-
D98	PEG_TX14+	PCI Express Graphics Lane 14 Transmit +	DP-O	-	-
D99	PEG_TX14-	PCI Express Graphics Lane 14 Transmit -	DP-O	-	-
D100	GND	Power Ground	PWR GND	-	-
D101	PEG_TX15+	PCI Express Graphics Lane 15 Transmit +	DP-O	-	-
D102	PEG_TX15-	PCI Express Graphics Lane 15 Transmit -	DP-O	-	-
D103	GND	Power Ground	PWR GND	-	-
D104	VCC_12V	Main Input Voltage	PWR 12V	-	-
D105	VCC_12V	Main Input Voltage	PWR 12V	-	-
D106	VCC_12V	Main Input Voltage	PWR 12V	-	-
D107	VCC_12V	Main Input Voltage	PWR 12V	-	-

D108	VCC_12V	Main Input Voltage	PWR 12V	-	-
D109	VCC_12V	Main Input Voltage	PWR 12V	-	-
D110	GND	Power Ground	PWR GND	-	-

Mechanical Specification

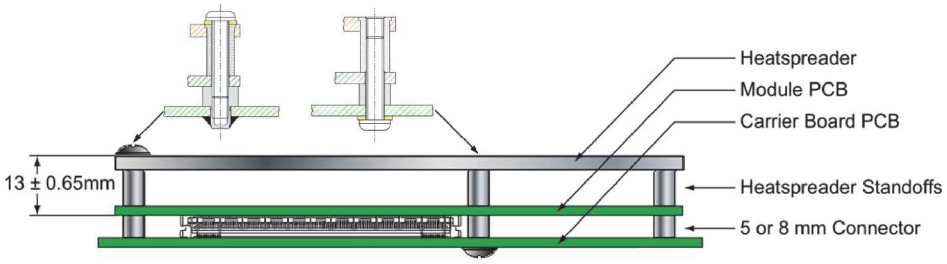
PCB Dimensions

- Basic - 125 mm x 95 mm



All dimensions are shown in millimeters.

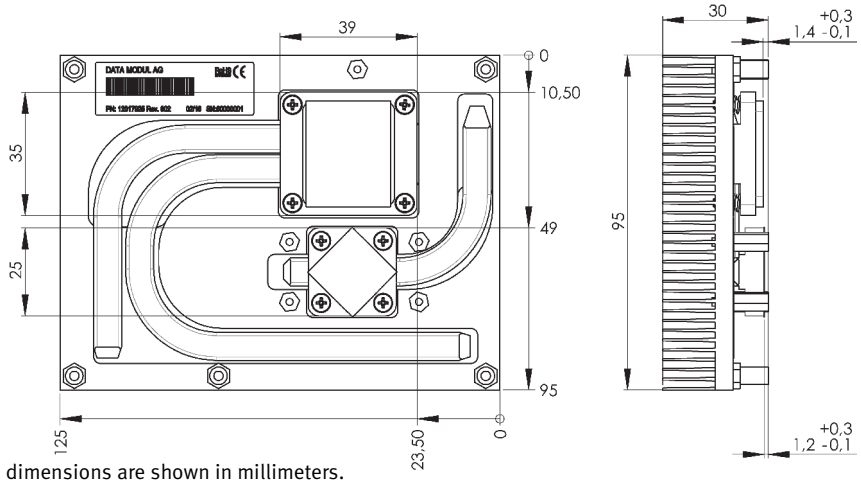
- Two defined heights:
  - 18 mm (5 mm carrier connector)
  - 21 mm (8 mm carrier connector)



Cooling Solution

DATA MODUL provides an active cooling solution with fan and a passive cooling solution without fan.

Assembly Heatspreader Dimensions



All dimensions are shown in millimeters.

Mechanical & Thermal Considerations

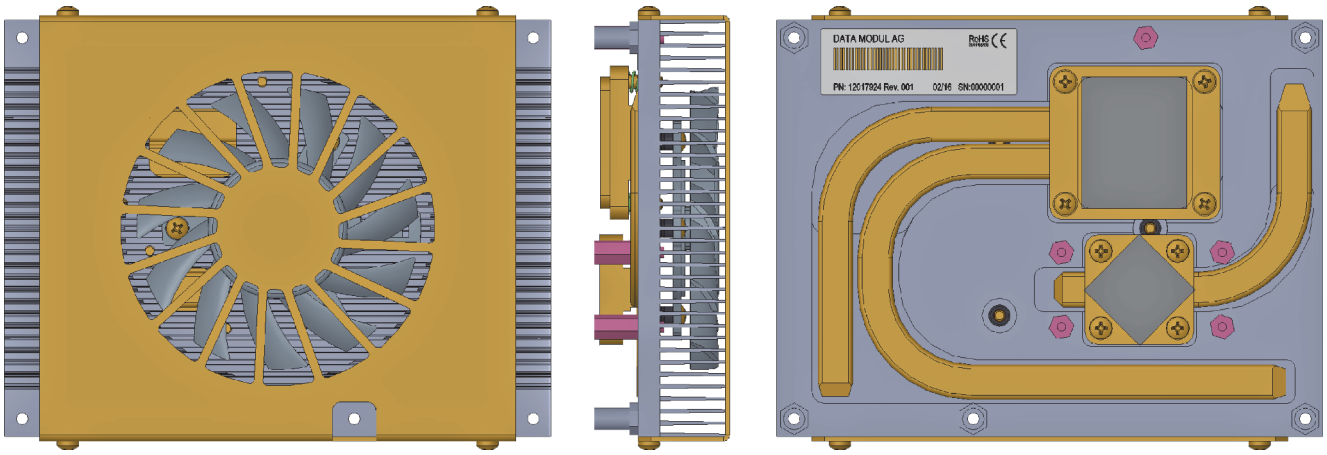
The eDM-COMB-BW6 is designed to operate within a temperature range of 0°C to 60°C.

An important factor for each system integration is the thermal design. The assembly heatspreader acts as thermal coupling device to the module. The assembly heatspreader is thermally coupled to the CPU and other heat generating components via a fan or heat pipe.

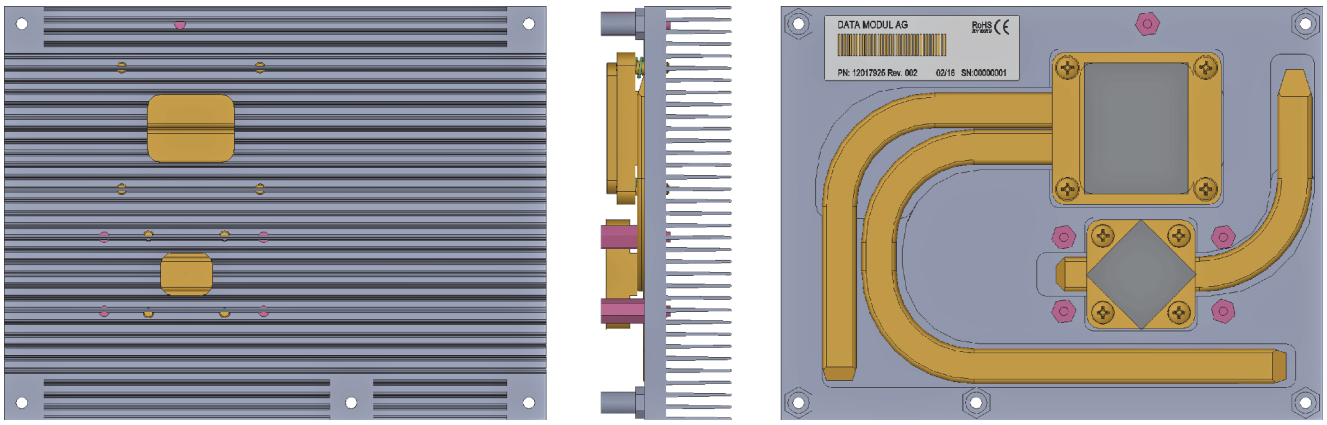
Although the assembly heatspreader is the thermal interface where most of the heat generated by the module is dissipated, it is not be considered as a heatsink. It has been designed to be used as thermal interface between the module and the application thermal solution. The application specific thermal solution may use heatsinks with fans, and heat pipes.

Do not operate the eDM-COMB-BW6 without properly attached assembly heatspreader (cooling solution).

Standard Cooling Solution with Fan



Standard Cooling Solution passive (without Fan)



BIOS Setup

The UEFI Setup program allows users to modify the basic system configuration and save these settings to NVRAM.
Note: The bold marked values in the following tables represent the default value.

Terms & Abbreviations

Term	Description
ACPI	Advanced Configuration and Power Interface
AES	Advanced Encryption Standard
AFU	AMI Firmware Update
ASPM	Active State Power Management
BBS	BIOS Boot Specification
COM	Computer On Module
CRID	Compatible Revision ID
CSM	Compatibility Support Module
CTDP	Configurable TDP
DMI	Direct Memory Interface
DTS	Digital Thermal Sensor
DVMT	Dynamic Video Memory Technology
ECP	Enhanced Capabilities Port
EFP	External Flat Panel
EHCI	Enhanced Host Controller Interface
EIS	Enhanced Intel Speedstep
EPP	Enhanced Parallel Port
IGFX	Intel Graphics
IPv4/IPv6	Intel Protocol Version
KEK	Key Exchange Key
LBAR	Linear Base Address Register
LFP	Local Flat Panel
MRC	Memory Reference Code
NMI	Non-Maskable Interrupt
NVRAM	Non-Volatile Random-Access Memory
OPROM	Option ROM
OS	Operating System
PK	Platform Key
PME	Power Management Event
PVM	Pulse Width Modulation
PXE	Preboot Execution Environment
RAID	Redundant Array of Independent Disk
SCI	System Control Interrupt
SMI	System Management Interrupt
SO-DIMM	Small Outline Dual Inline Memory Module
SPP	Standard Parallel Port
TDP	Thermal Design Power
TOLUD	Top Of Lower Usable Memory
TXT	Trusted Execution Technology
VT-d	Virtualization Technology for Directed I/O
WDT	Wachtdog Timeout
XHCI	eXtensible Host Controller Interface

BIOS Update Description

The eDM-COM Boards are provided with an American Megatrends, Inc. Aptio V UEFI Firmware. Please use the AMI Firmware Update (AFU) utility suite for updating the BIOS. This is a scriptable command line tool, utilized for factory or field BIOS updates. It is available for DOS, Microsoft Windows®, Linux, FreeBSD and the UEFI shell.
Please contact your DATA MODUL support for accessing the tools.

The complete UEFI Firmware image for this COM consists of the following parts:

- Main BIOS: Responsible for main hardware initialization and feature interfaces during runtime.
- Boot Block: Minimal hardware initialization and provides recovery functionality.
- NVRAM: Stores configuration variables.
- GbE Region: Stores Gigabit-Ethernet configuration data.

DATA MODUL may deliver two different versions of an UEFI Firmware image, depending on which parts of the complete image have to be updated. Following are two example command lines for the UEFI version of AFU. For complete command reference, please check the appropriate readme files within the tools suites.

Complete Firmware Image including all parts with a size of 16MB:

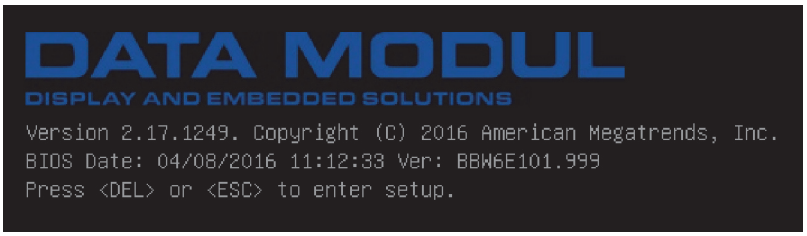
- afuefix64.efi newbiosfile.bin /P /B /N /MER /FDT /X

BIOS only Image including Main BIOS, Bootblock and NVRAM with a size of 6MB:

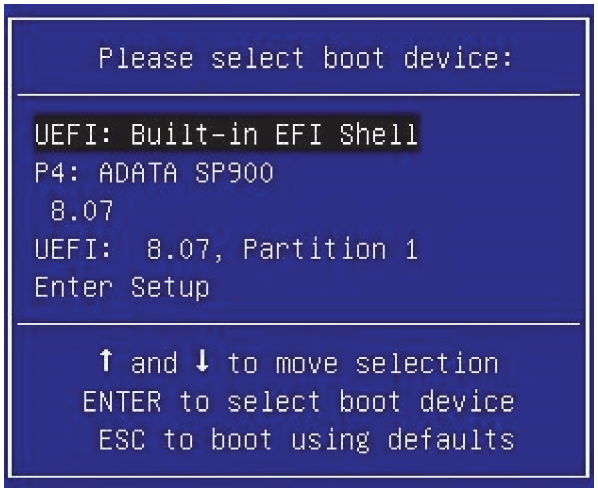
- afuefix64.efi newbiosfile.bin /P /B /N /X

Enter the BIOS Setup

To enter UEFI Setup, press DEL or ESC during POST.



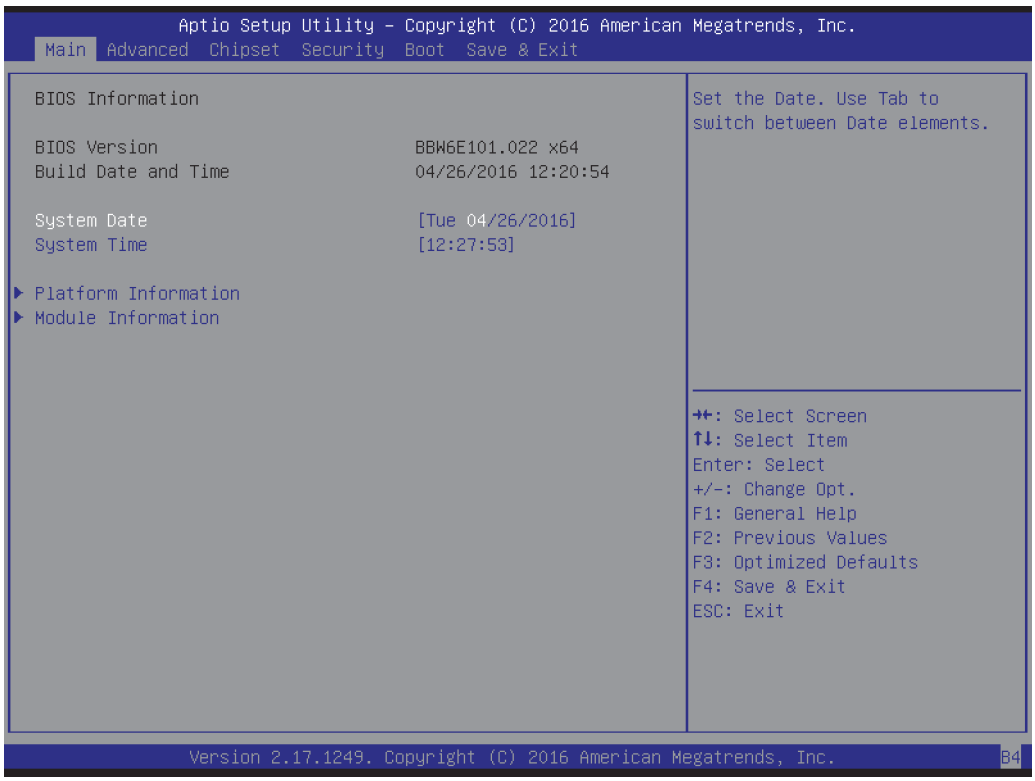
To select a Boot Popup Menu, press F7 during POST. At End of Post a selection menu will show all available boot devices to choose from. UEFI Setup program can be entered from Boot Popup Menu as well.



Following is a description of the UEFI Setup pages.

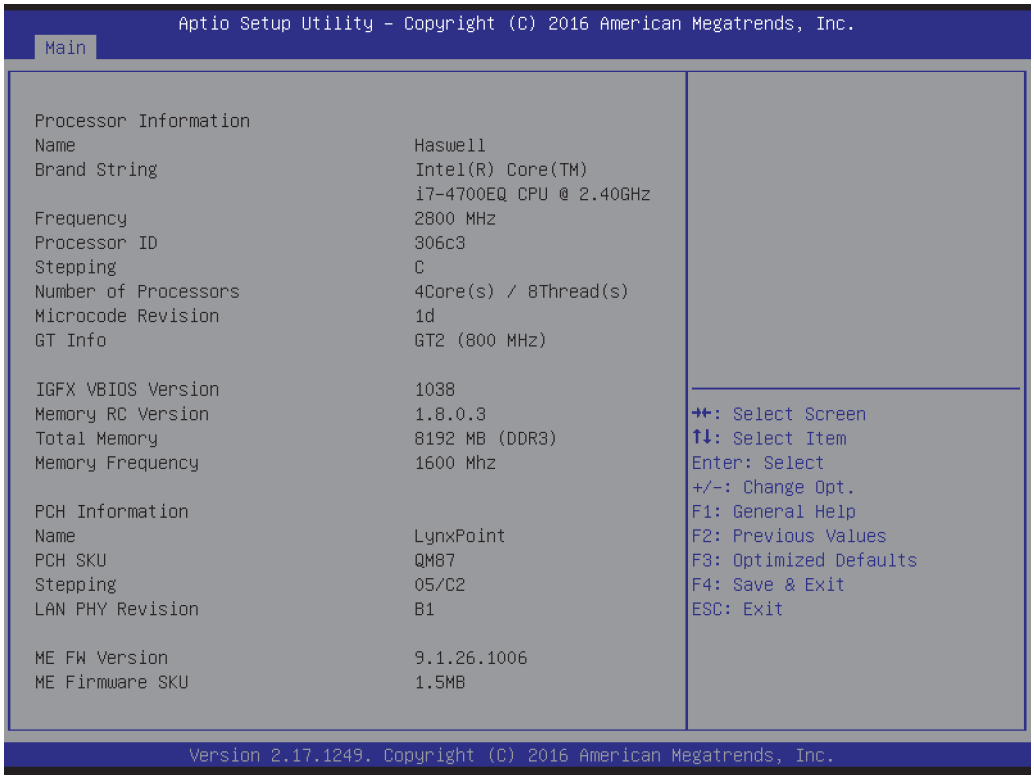
Main

The Main Setup screen lists the following information:

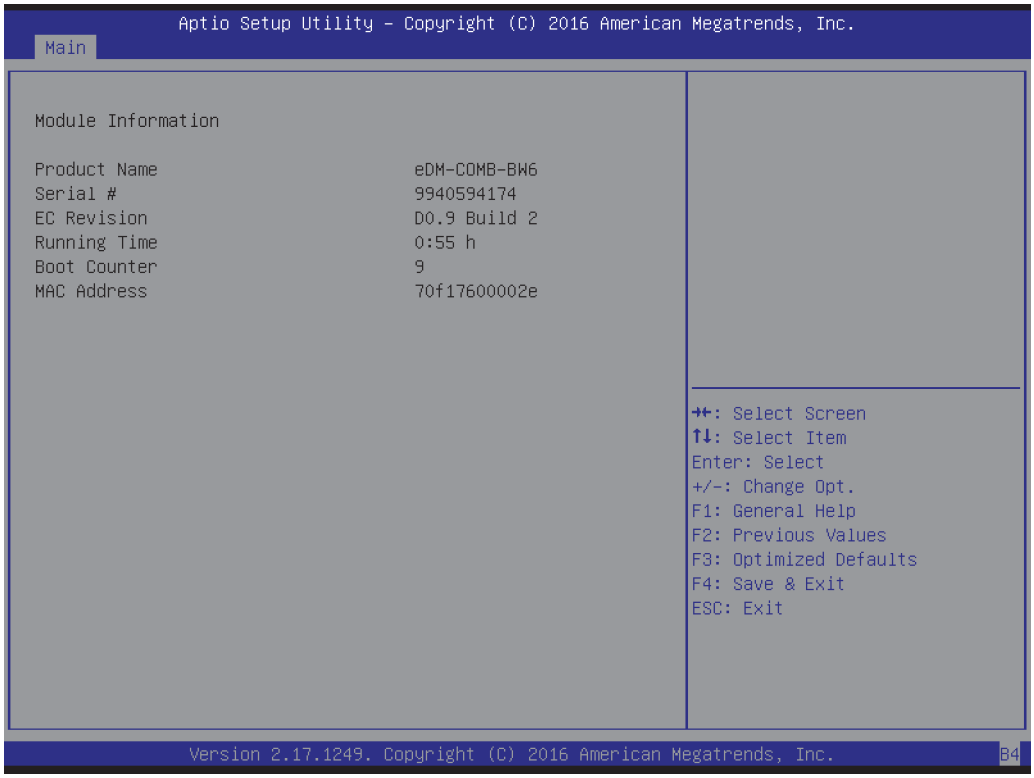


Parameter	Value	Comment
System Date	Day MM/DD/YYYY	Set the Date.
System Time	HH:MM:SS	Set the Time.
Platform Information	Submenu	Displays Platform Information.
Module Information	Submenu	Displays Module Information.

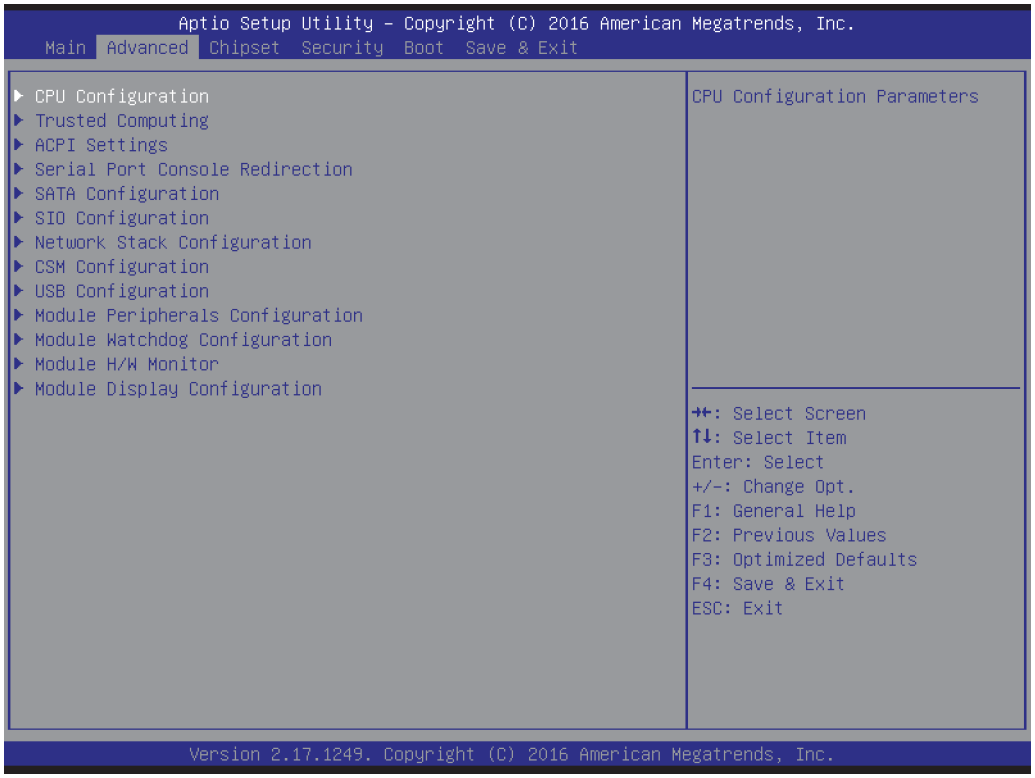
Platform Information



Module Information

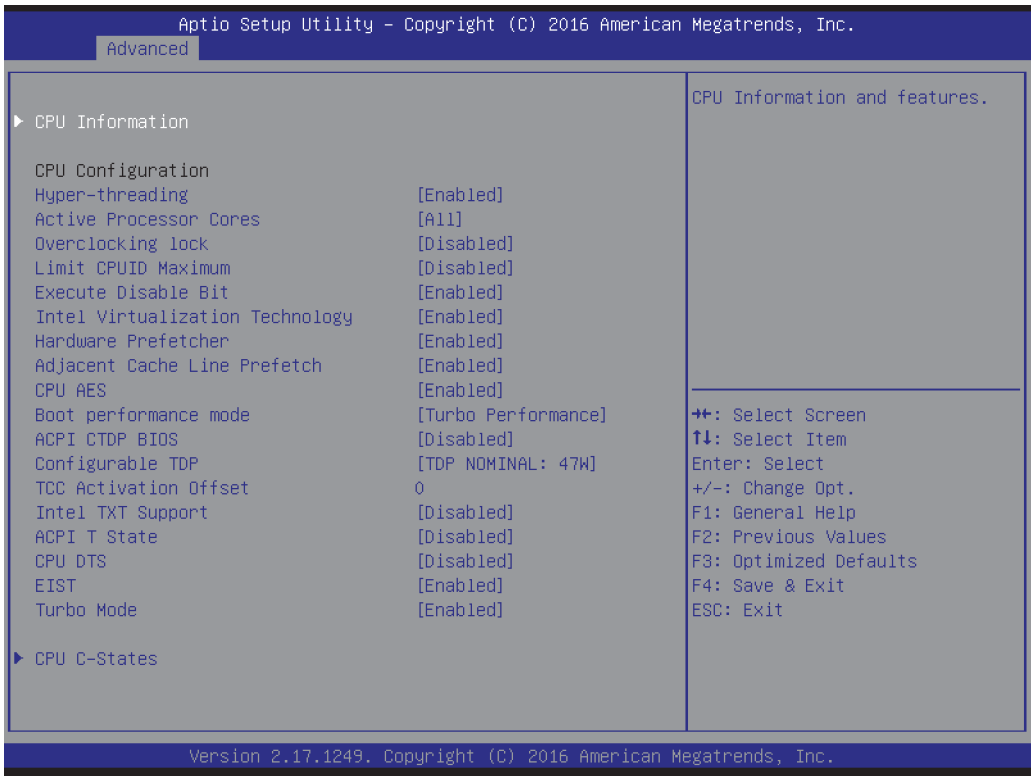


Advanced



Parameter	Value	Comment
CPU Configuration	Submenu	CPU Configuration Parameters
Trusted Computing	Submenu	Trusted Computing (TPM) Settings
ACPI Settings	Submenu	System Advanced Configuration and Power Interface (ACPI) Settings
Serial Port Console Redirection	Submenu	Serial Port Console Redirection Settings
SATA Configuration	Submenu	SATA Device Settings
SIO Configuration	Submenu	SuperIO Settings
Network Stack Configuration	Submenu	Network Stack Settings
CSM Configuration	Submenu	Compatibility Support Module Settings
USB Configuration	Submenu	USB Configuration Parameters
Module Peripherals Configuration	Submenu	Configure Module Peripherals
Module Watchdog Configuration	Submenu	Configure Watchdog
Module H/W Monitor	Submenu	Monitor hardware status
Module Display Configuration	Submenu	Configure Module Display options

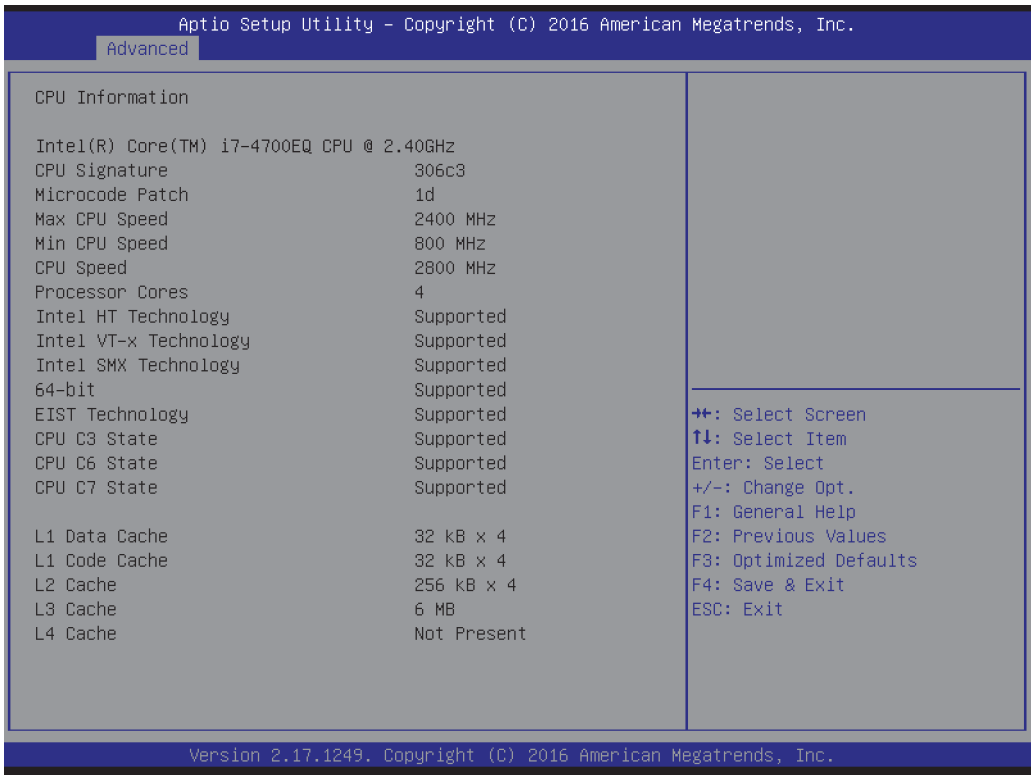
CPU Configuration



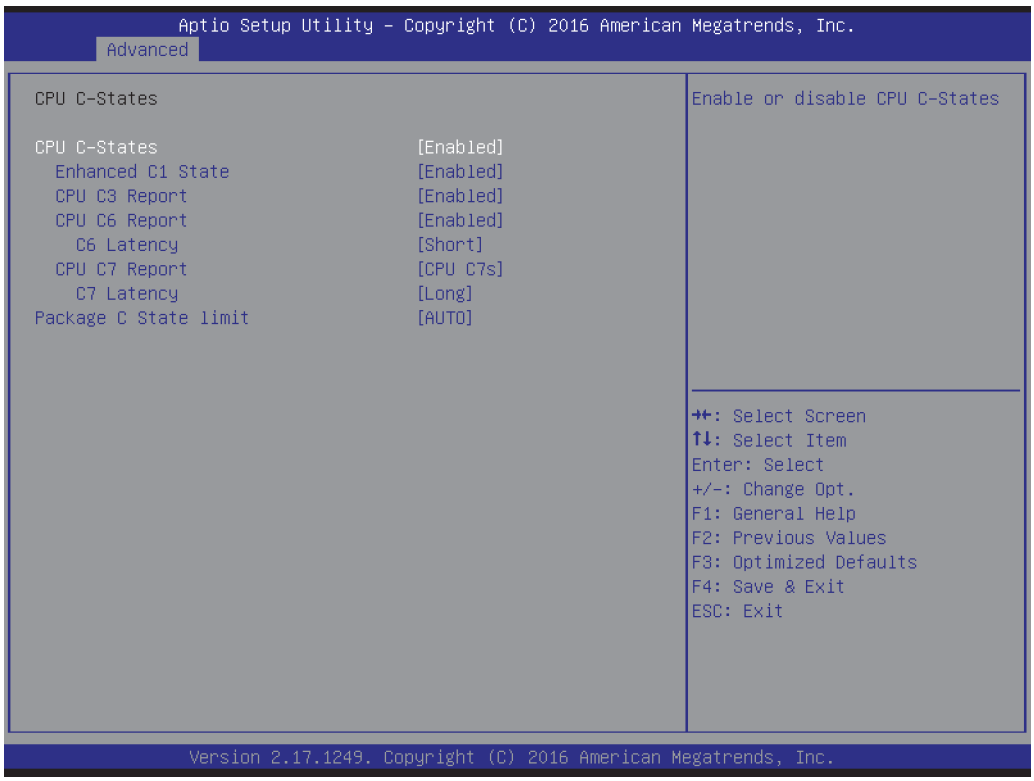
Parameter	Value	Comment
CPU Information	Submenu	CPU information and features.
Hyper-threading	**Enabled** Disabled	When Enabled, a second thread per enabled core is enabled.
Active Processor Cores	**All** 1 2 3	Number of cores to enable in each processor package.
Overclocking lock	Enabled **Disabled**	Lock BURST_RATIO_LIMIT (MSR 1AD) for overriding.
Limit CPUID Maximum	Enabled **Disabled**	Limit maximum supported CPUID instruction function to a max value of 3. I.g. Windows NT cannot handle a Maxval > 3.
Execute Disable Bit	**Enabled** Disabled	Execute Disable can prevent certain classes of malicious buffer overflow attacks.
Intel Virtualization Technology	**Enabled** Disabled	When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.
Hardware Prefetcher	**Enabled** Disabled	Enable the Mid Level Cache (L2) streamer prefetcher.
Adjacent Cache Line Prefetch	**Enabled** Disabled	Enable the Mid Level Cache (L2) prefetching of adjacent cache lines.
CPU AES	**Enabled** Disabled	Enable/Disable CPU Advanced Encryption Standard instructions.
Boot performance mode	Max Non-Turbo Performance Max Battery **Turbo Performance**	Select the performance state that the BIOS will set before OS handoff.
ACPI CTDP BIOS	Enabled **Disabled**	Enable/Disable ACPI Configurable TDP BIOS support (Tabled Ctdp8).
Configurable TDP	**TDP NOMINAL** TDP DOWN TDP TOP	Allow reconfiguration of TDP levels based on current power and thermal delivery capabilities of the system.
TCC Activation Offset	**0** ... 15	Offset from the factory TCC activation temperature.

Parameter	Value	Comment
Intel TXT Support	Enabled **Disabled**	Enables or Disables Intel(R) Trusted Execution Technology (LaGrande Technology) support.
ACPI T State	Enabled **Disabled**	Enable/Disable ACPI T state support.
CPU DTS	Enabled **Disabled**	Enabled: ACPI thermal management uses DTS SMM mechanism to obtain CPU temperature values. Disabled: DTS SMM and ACPI thermal management is disabled.
EIST	**Enabled** Disabled	Enable/Disable Enhanced Intel SpeedStep Technology.
Turbo Mode	**Enabled** Disabled	Enable/Disable Intel Turbo Mode.
CPU C-States	Submenu	Configure CPU C-State features.

CPU Information

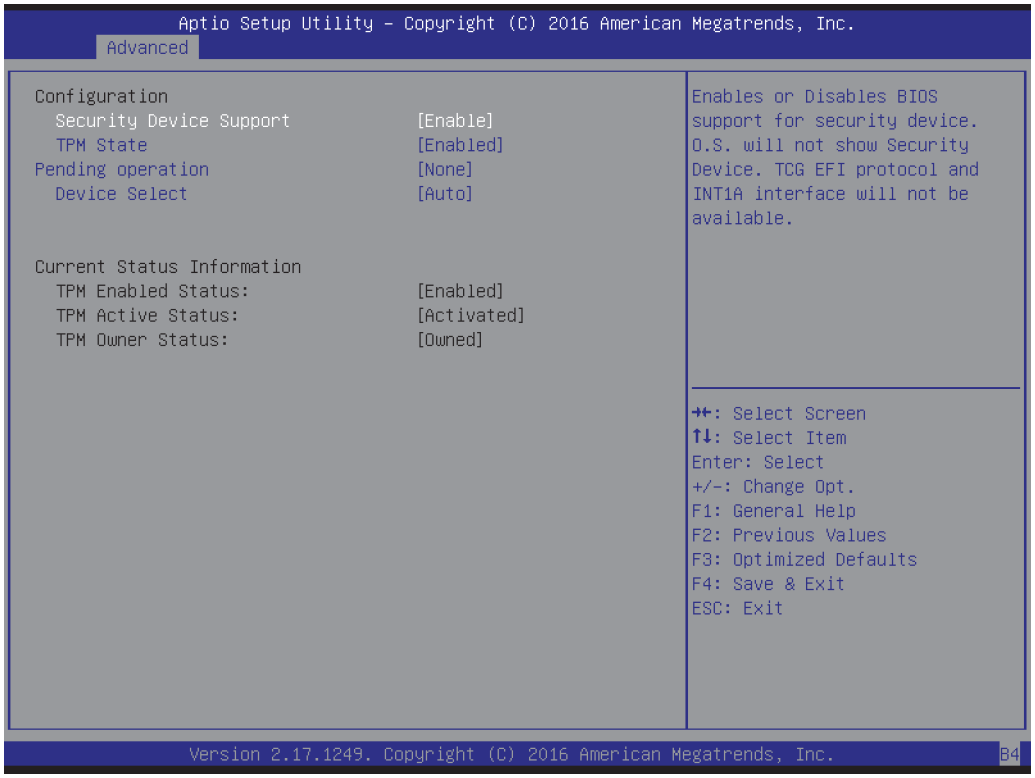


CPU C-States



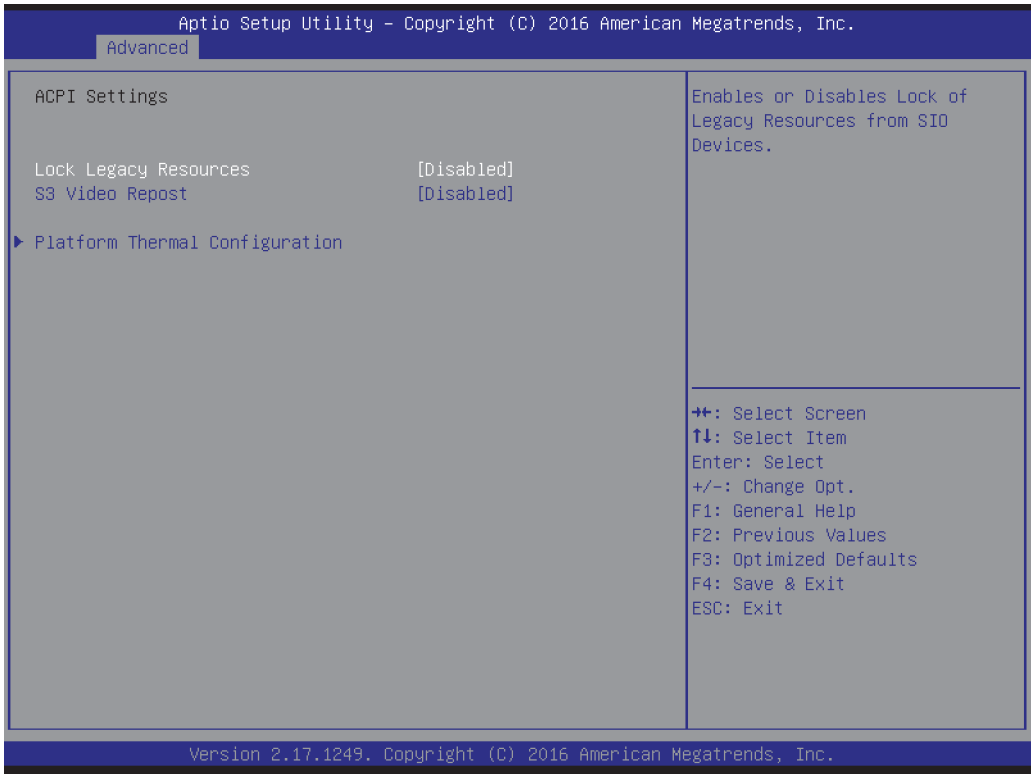
Parameter	Value	Comment
CPU C-States	**Enabled** Disabled	Enable/Disable CPU C-States support.
Enhanced C1 State	**Enabled** Disabled	Enable/Disable Enhanced C1 state.
CPU C3 Report	**Enabled** Disabled	Enable/Disable CPU C3 report to OS.
CPU C6 Report	Enabled **Disabled**	Enable/Disable CPU C6 report to OS.
C6 Latency	**Short** Long	Configure Short/Long latency for C6.
CPU C7 Report	Disabled CPU C7 **CPU C7s**	Enable/Disable CPU C7 report to OS.
C7 Latency	Short **Long**	Configure Short/Long latency for C7.
Package C-State limit	C0 C2 C3 C6 C7 C7s **AUTO**	Set the Package C-State limit.

Trusted Computing



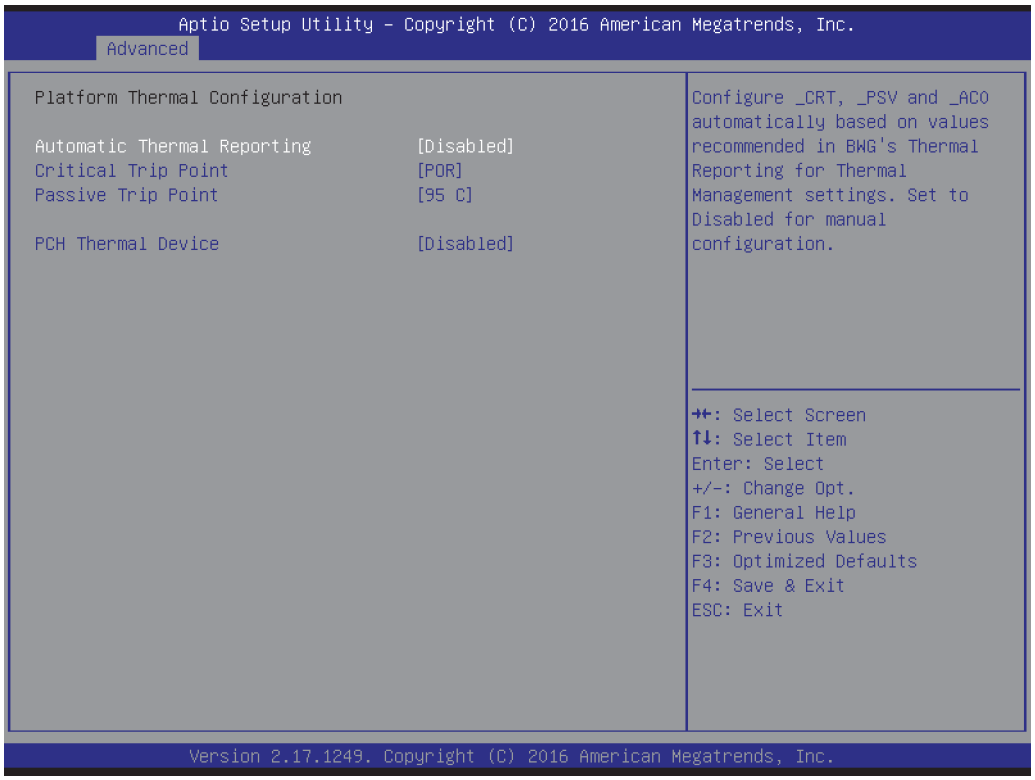
Parameter	Value	Comment
Security Device Support	**Enabled** Disabled	Enable/Disable BIOS support for security device. If disabled, OS will not show Security Device. TCG EFI protocol and INT1A interface will not be available.
TPM State	**Enabled** Disabled	Enable/Disable Security Device.
Pending operation	None **Clear TPM**	Clear TPM resets TPM to its default state. It removes the owner authorization value and any keys stored in the TPM.
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 the default set to TPM 2.0 devices if not found, TPM 1.2 devices will be enumerated.

ACPI Settings



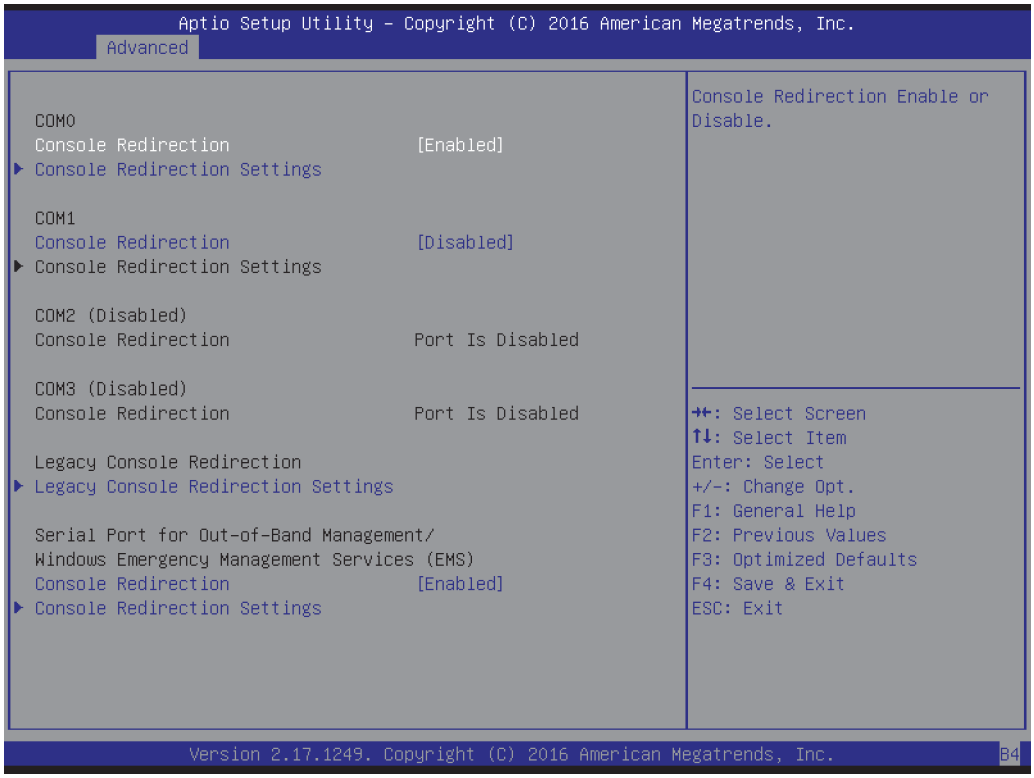
Parameter	Value	Comment
Lock Legacy Resources	Enabled **Disabled**	Enables/Disables Lock of Legacy Resources from SIO Devices.
S3 Video Repost	Enabled **Disabled**	Enables/Disables re-initialization of VBIOS during S3 resume.
Platform Thermal Configuration	Submenu	Platform Thermal Configuration options.

Platform Thermal Configuration



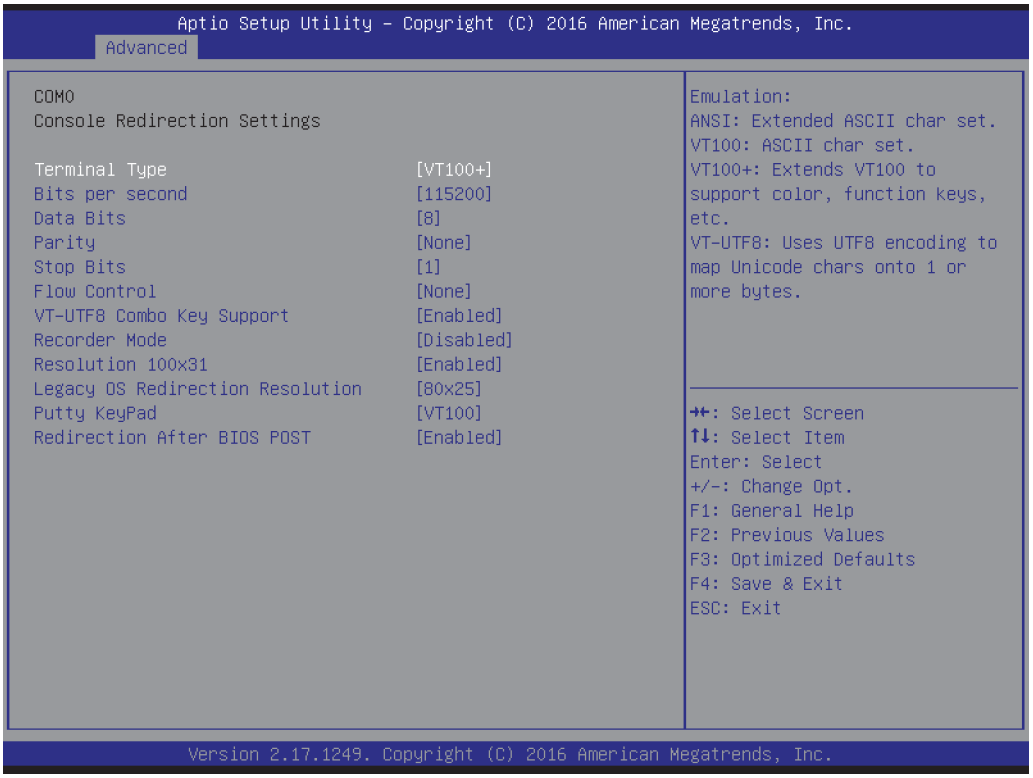
Parameter	Value	Comment
Automatic Thermal Reporting	Enabled **Disabled**	Enabled: Configure Critical Trip Point (_CRT) and Passive Trip Point (_PSV) automatically based on Intel recommendations. Disabled: Configure manually.
Critical Trip Point	**POR** 63 C 71 C 79 C 87 C 95 C 103 C	This value controls the temperature of the ACPI Critical Trip Point - the point at which the OS will shut the system off. NOTE: 100C is the Plan Of Record (POR) for all Intel mobile processors.
Passive Trip Point	Disabled 39 C 47 C 55 C 63 C 71 C 79 C 87 C **95 C**	This value controls the temperature of the ACPI Passive Trip Point - the point at which the OS will begin throttling the processor.
PCH Thermal Device	Enabled **Disabled**	Enable/Disable PCH Thermal Device (D31:F6).

Serial Port Console Redirection



Parameter	Value	Comment
Console Redirection	**Enabled** Disabled	Enables/Disables Console Redirection.
Console Redirection Settings	Submenu	The settings specify how the host computer and the remote computer (which the user is using) will exchange data. Both computers should have the same or compatible settings.
Legacy Console Redirection Settings	Submenu	Configure Port for Legacy Console Redirection.

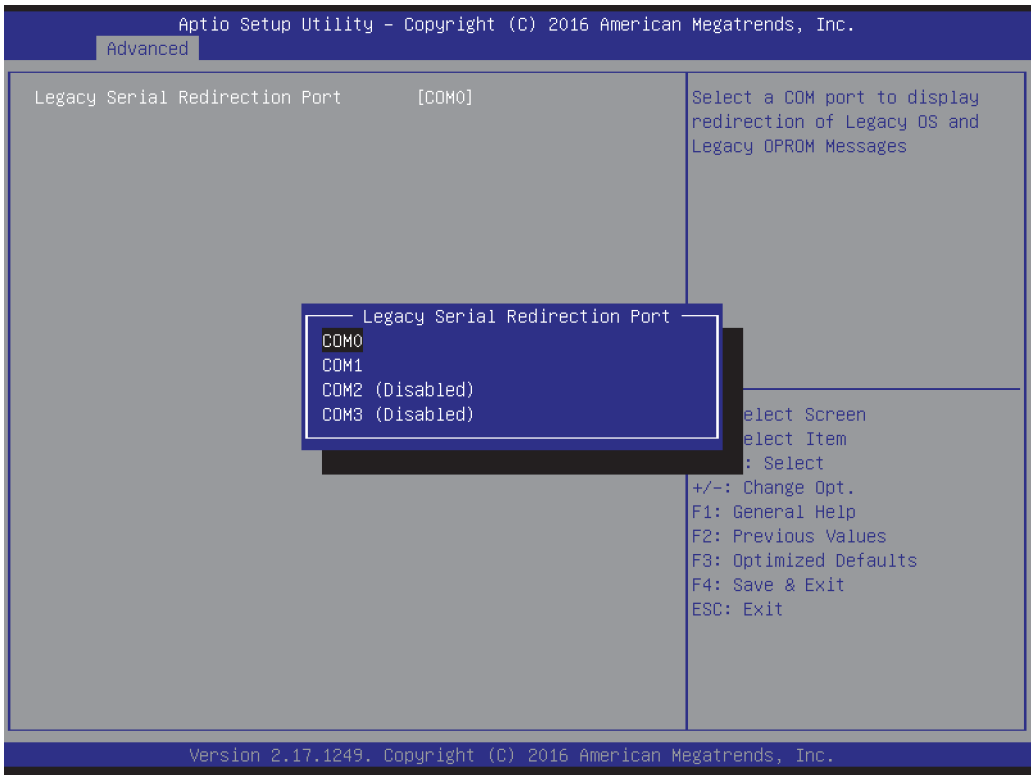
Console Redirection Settings



Parameter	Value	Comment
Terminal Type	VT100 **VT100+** VT-UTF8 ANSI	Emulation: ANSI: Extended ASCII char set. VT100: ASCII char set. VT100+: Extends VT100 to support color, function keys, etc. VT-UTF8: Uses UTF8 encoding to map Unicode chars onto 1 or more bytes.
Bits per seconds	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**	Configures the number of data bis. 8 is recommended to easily use the link for file transfer and non-English text transfer.
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.
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	**Enabled** Disabled	Enable: VT-UTF8 Combination Key Support for ANSI/VT100 terminals.
Recorder Mode	Enabled **Disabled**	With this mode enabled, only text will be sent. This is to capture Terminal data.
Resolution 100x31	**Enabled** Disabled	Enables/Disables extended terminal resolution.

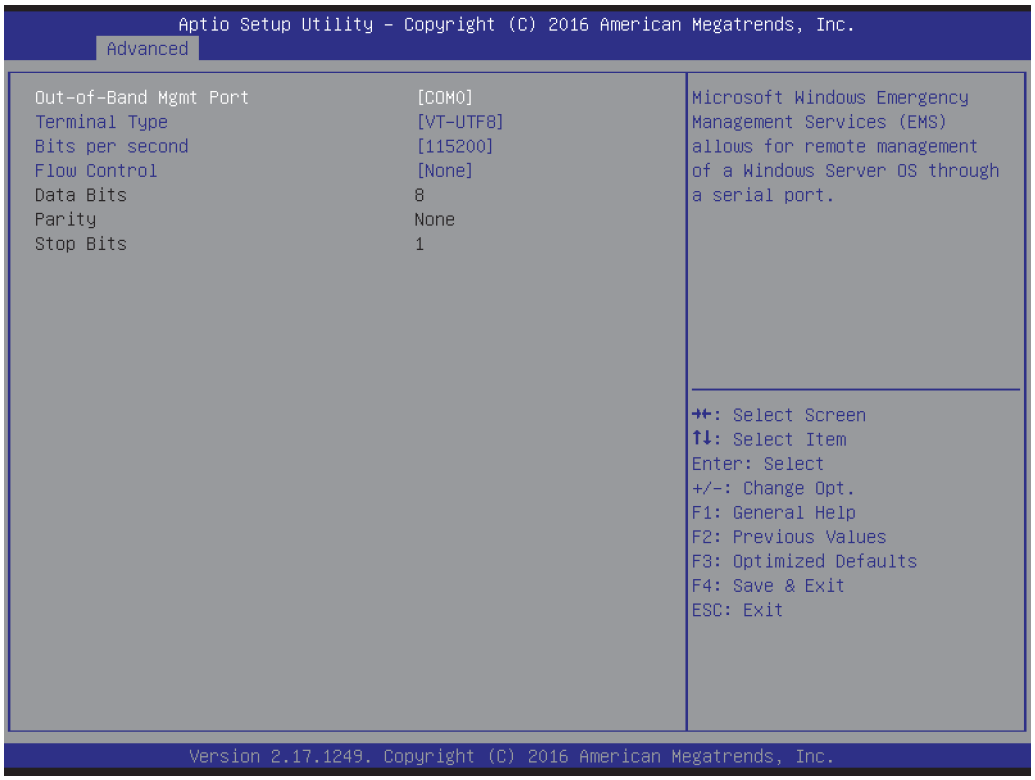
Parameter	Value	Comment
Legacy OS Redirection Resolution	80x24 **80x25**	On Legacy OS, the Number of Rows and Columns supported by redirection.
Putty KeyPad	**VT100** LINUX XTERMR6 SCO ESCN VT400	Select FunctionKey and KeyPad on Putty.
Redirection After BIOS POST	**Enabled** Disabled	Enabled: Console Redirection is available for Legacy OS. Disabled: Legacy console redirection is disabled before booting to Legacy OS.

Legacy Console Redirection Settings



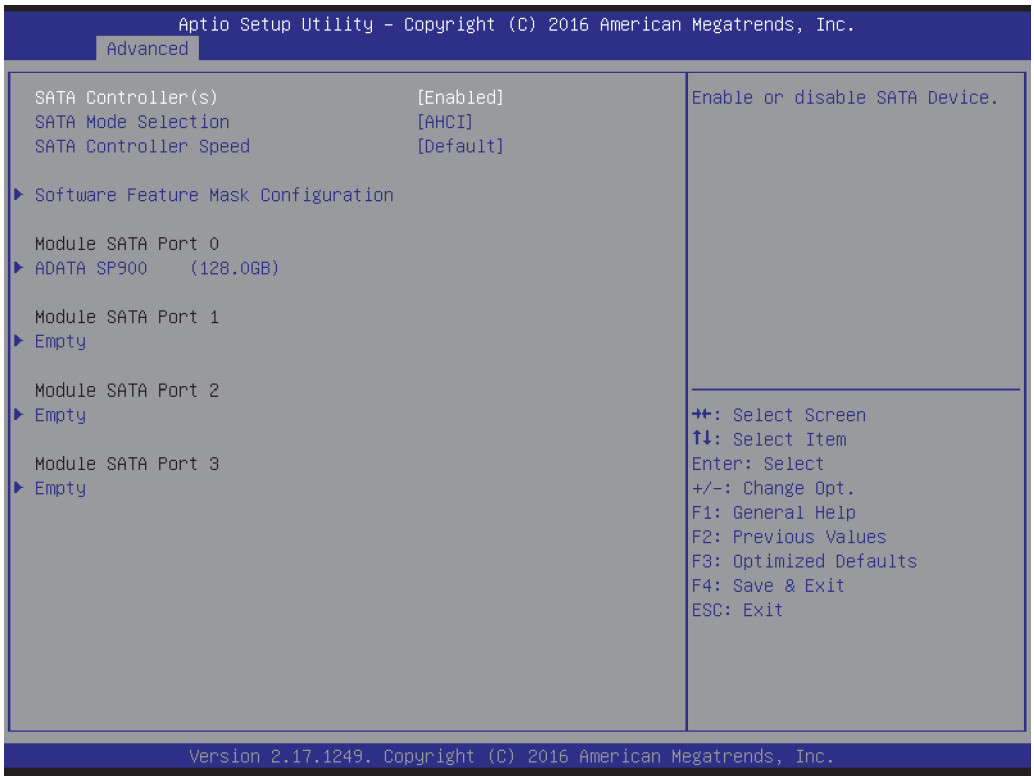
Parameter	Value	Comment
Legacy Serial Redirection Port	**COM0** COM1 COM2 COM3	Select a COM Port to use for Legacy OS and Legacy OPROM Console Redirection.

Serial Port for Out-of-Band Management/Windows Emergency Management Services (EMS)



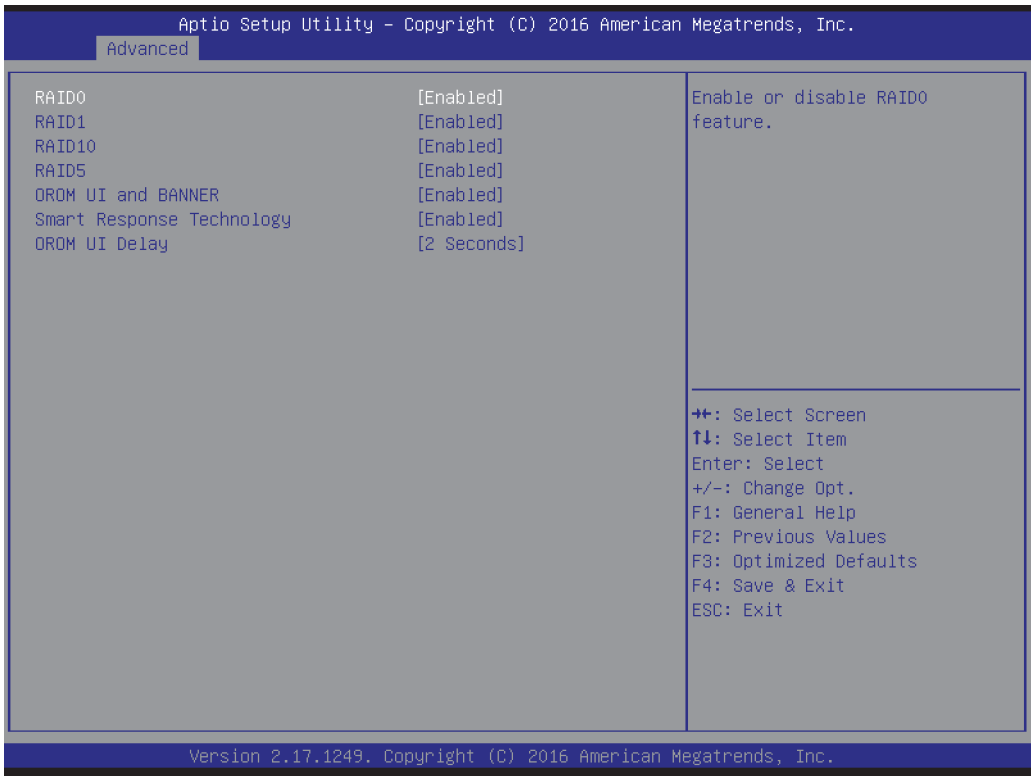
Parameter	Value	Comment
Out-Of-Band Mgmt Port	**COM0** COM1 COM2 COM3	Select a COM Port to use for Microsoft Windows Emergency Management Services (EMS). EMS allows for remote management of a Windows Server OS through a serial port.
Terminal Type	VT100 VT100+ **VT-UTF8** ANSI	VT-UTF8 is the preferred 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 seconds	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	**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.

SATA Configuration



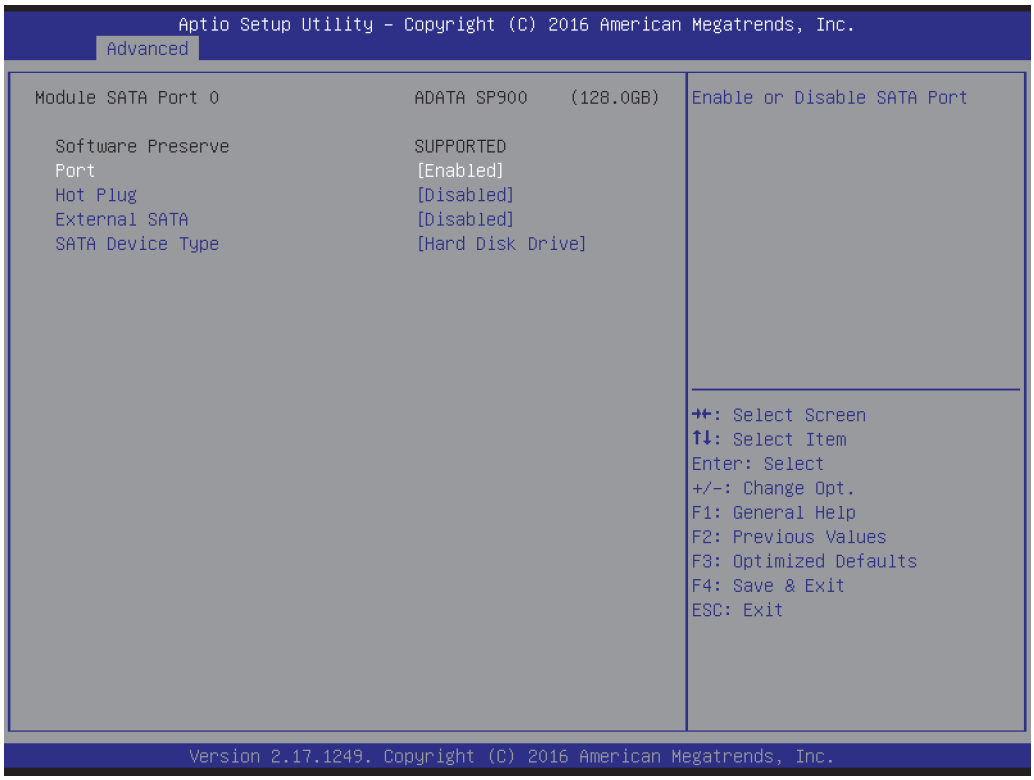
Parameter	Value	Comment
SATA Controller(s)	**Enabled** Disabled	Enable or disable SATA Device.
SATA Mode Selection	DIE **AHCI** RAID	Determines how SATA controller(s) operate.
SATA Controller Speed	**Default** Gen1 Gen2 Gen3	Default configures controller speed to max supported speed of connected devices. Other values limit speed to according value.
Software	Submenu	Configure RAID and Smart Response Technology features.
Module SATA Port	Submenu	Configure SATA port.

Software Feature Mask Configuration



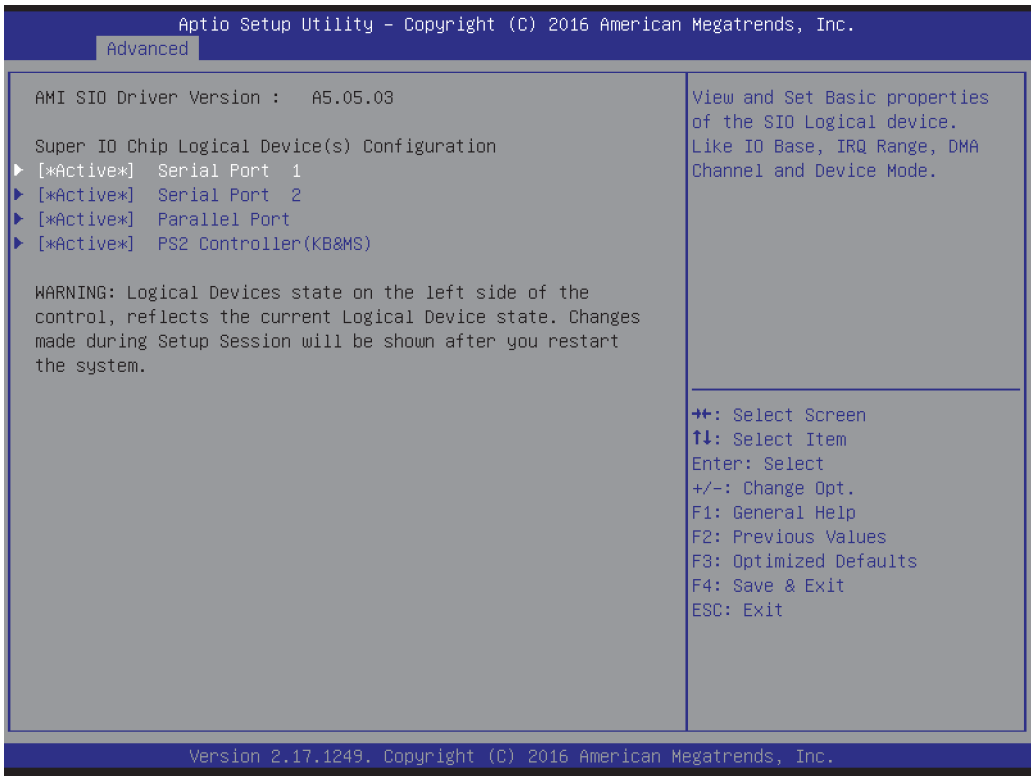
Parameter	Value	Comment
RAID0	**Enabled** Disabled	Enable or disable RAID0 feature.
RAID1	**Enabled** Disabled	Enable or disable RAID1 feature.
RAID10	**Enabled** Disabled	Enable or disable RAID10 feature.
RAID5	**Enabled** Disabled	Enable or disable RAID5 feature.
OPROM Interface	**Enabled** Disabled	If enabled, the OPROM User Interface is shown. Otherwise, no OPROM banner or information will be displayed if all disks and RAID volumes are normal.
OPROM Interface Delay	**2 Seconds** 4 Seconds 6 Seconds 8 Seconds	If enabled, indicates the delay of the OPROM User Interface Splash Screen in a normal status.
Smart Response Technology	**Enabled** Disabled	Enable or disable Smart Response Technology.

Module SATA Port



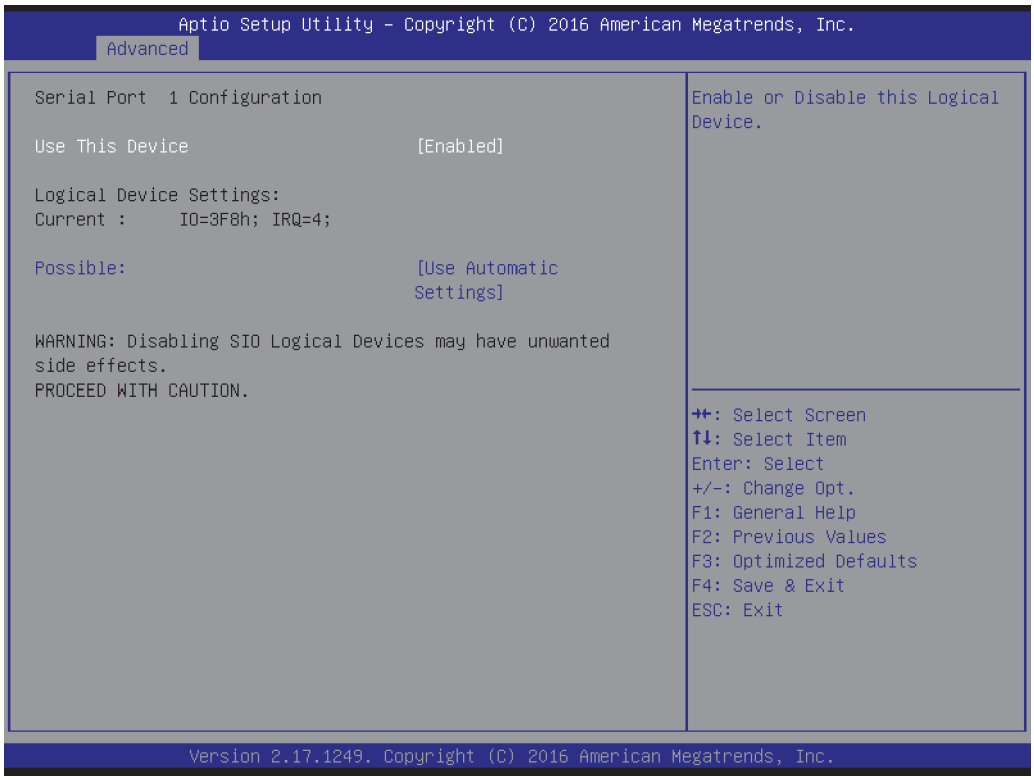
Parameter	Value	Comment
Port	**Enabled** Disabled	Enable or disable SATA Port.
Hot Plug	Enabled **Disabled**	Designates this port as hot pluggable.
External SATA	Enabled **Disabled**	External SATA Support.

SIO Configuration



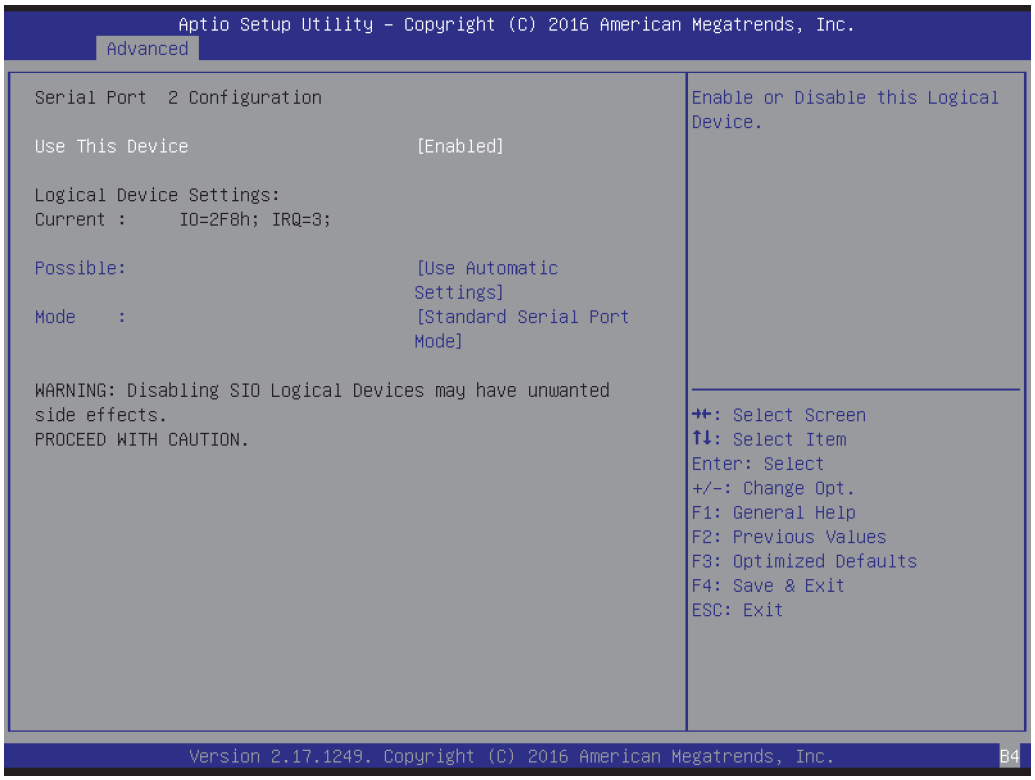
Parameter	Value	Comment
Serial Port 1	Submenu	View and set basic properties of the SIO logical device. Like IO base, IRQ range, DMA channel and device mode.
Serial Port 2	Submenu	
Parallel Port	Submenu	
PS2 Controller (KB&MS)	Submenu	

Serial Port 1 Configuration



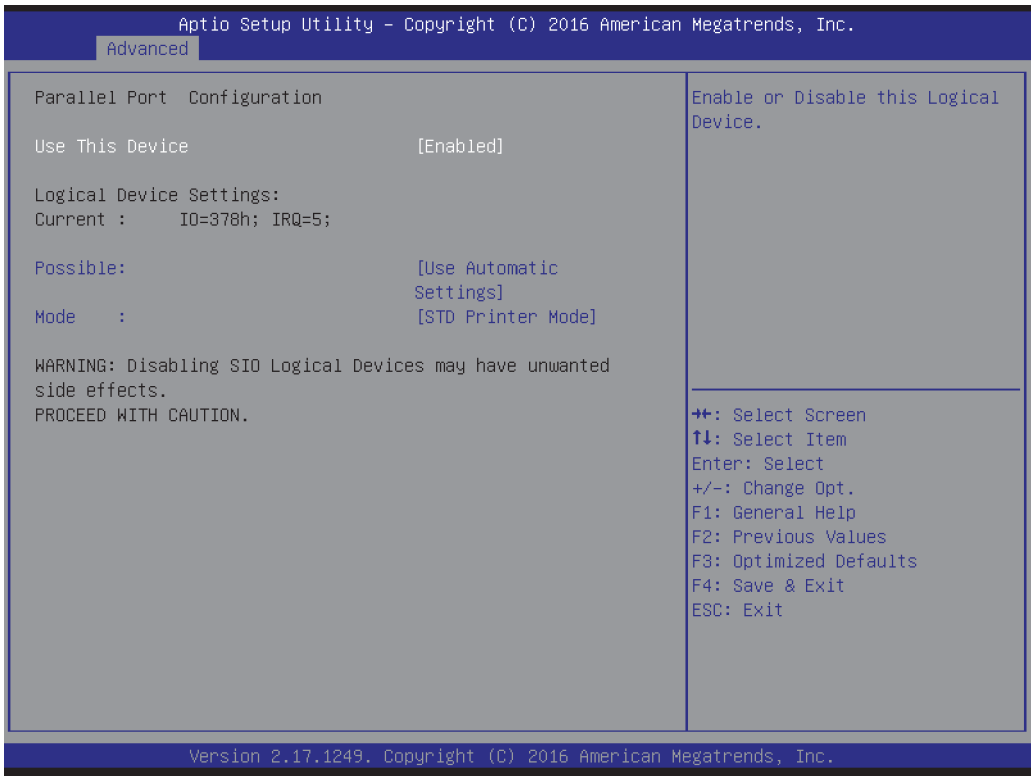
Parameter	Value	Comment
Use This Device	**Enabled** Disabled	Enable or Disable this Logical Device.
Possible	**Use Automatic Settings** IO=3F8h; IRQ=4 IO=2F8h IO=3E8h IO=2E8h IRQ=3,4,5,7,9,10,11,12	Configure Device's Resource settings. New settings will be reflected on This Setup Page after System restarts.

Serial Port 2 Configuration



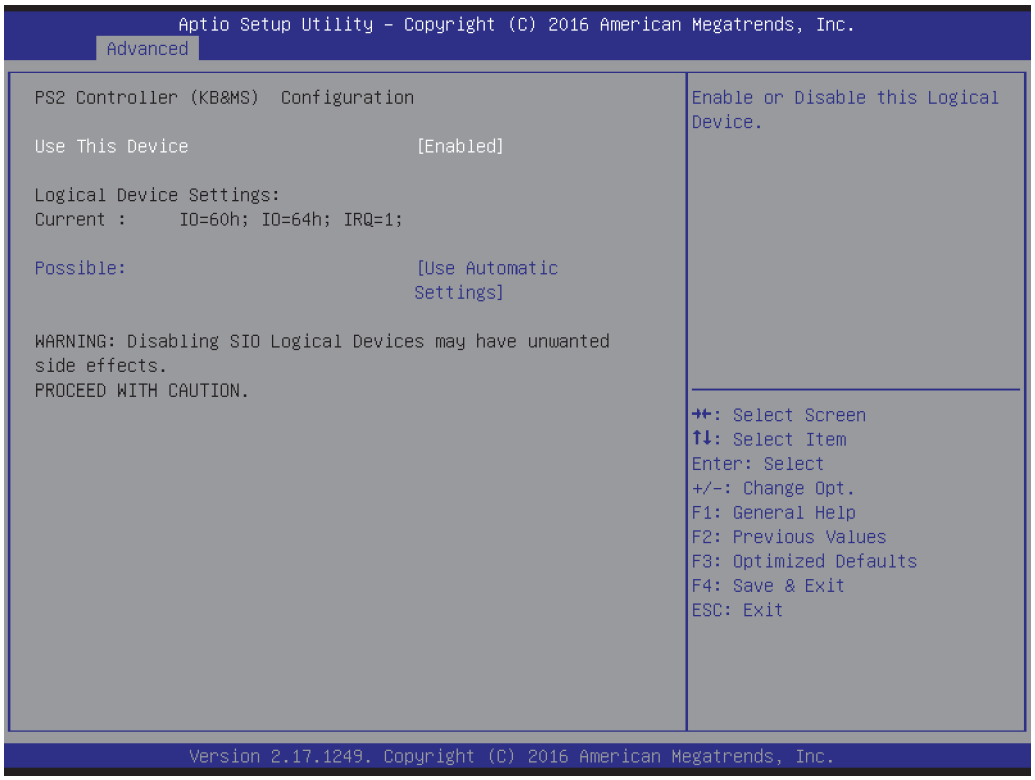
Parameter	Value	Comment
Use This Device	**Enabled** Disabled	Enable or Disable this Logical Device.
Possible	**Use Automatic Settings** IO=3F8h; IRQ=4 IO=2F8h IO=3E8h IO=2E8h IRQ=3,4,5,7,9,10,11,12	Configure Device's Resource settings. New settings will be reflected on This Setup Page after System restarts.
Mode	**Standard Serial Port Mode** IrDA Active pulse 1.6 uS IrDA Active pulse 3/16 bit time ASKIR Mode	Configure Standard or IrDA Mode of the Serial Port.

Parallel Port Configuration



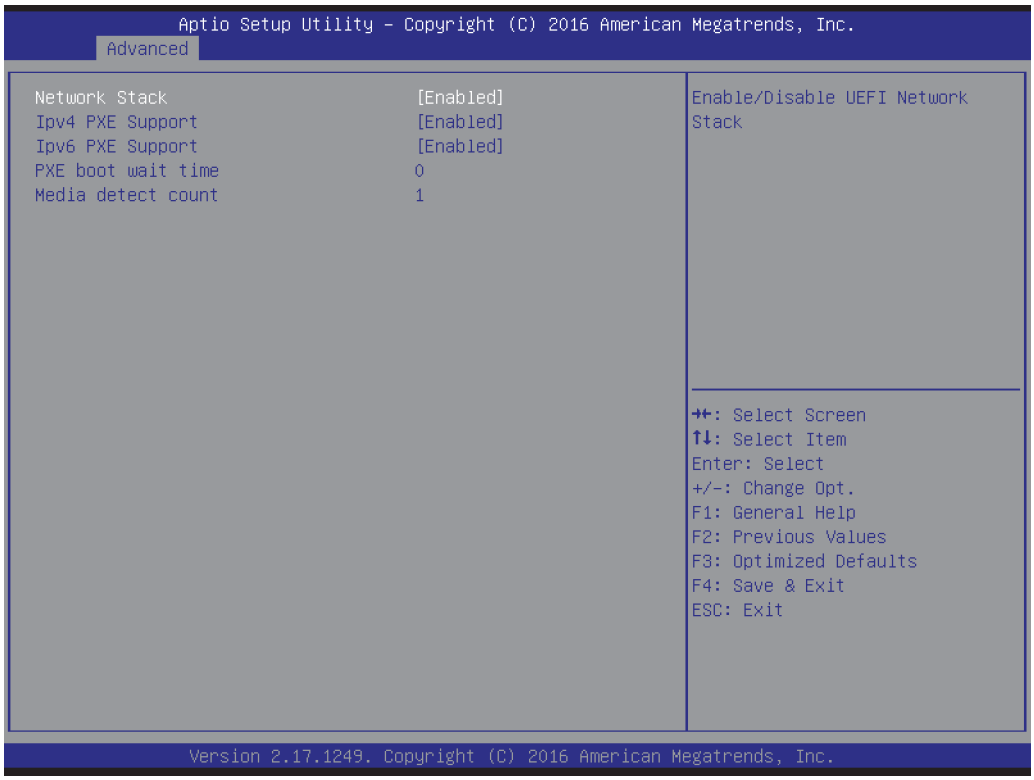
Parameter	Value	Comment
Use This Device	**Enabled** Disabled	Enable or Disable this Logical Device.
Possible	**Use Automatic Settings** IO=3F8h; IRQ=4 IO=2F8h IO=3E8h IO=2E8h IRQ=3,4,5,7,9,10,11,12	Configure Device's Resource settings. New settings will be reflected on This Setup Page after System restarts.
Mode	**STD Printer Mode** SPP Mode EPP-1.9 and SPP Mode EPP-1.7 and SPP Mode ECP Mode ECP and EPP 1.9 Mode ECP and EPP 1.7 Mode	Change Parallel Port mode. Some of the Modes required a DMA resource. After Mode changing, Reset the System to reflect actual device settings.

PS2 Controller (KB&MS) Configuration



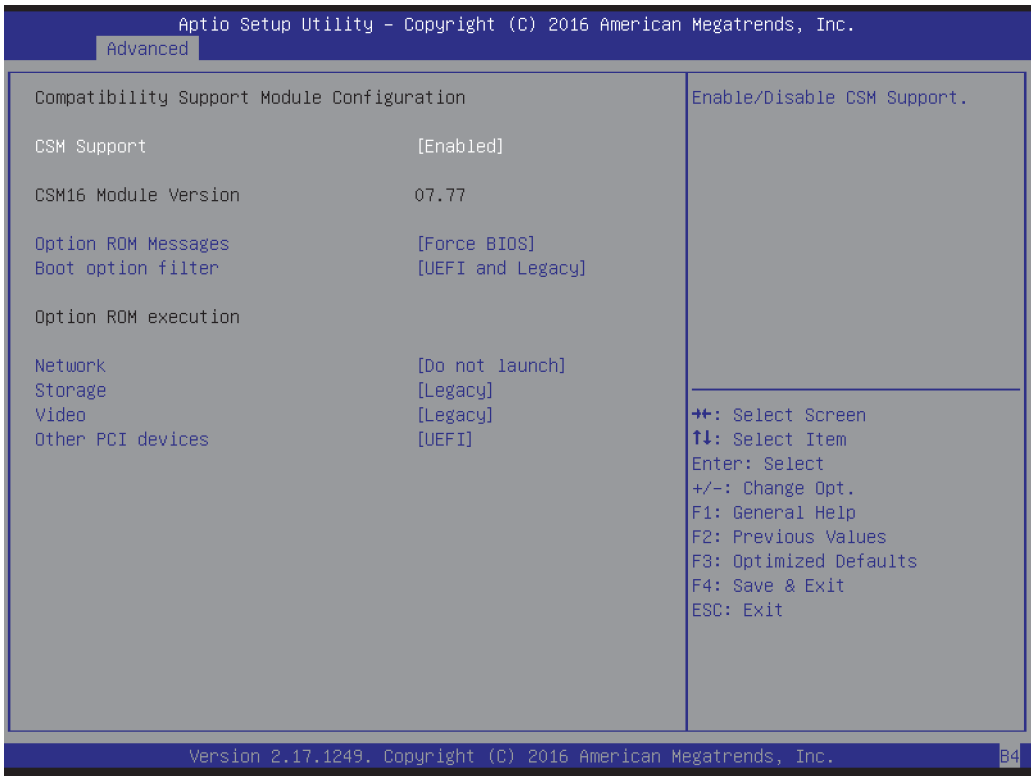
Parameter	Value	Comment
Use This Device	**Enabled** Disabled	Enable or Disable this Logical Device.
Possible	**Use Automatic Settings** IO=60h; IO=64h; IRQ=1	Configure Device's Resource settings. New settings will be reflected on This Setup Page after System restarts.

Network Stack Configuration



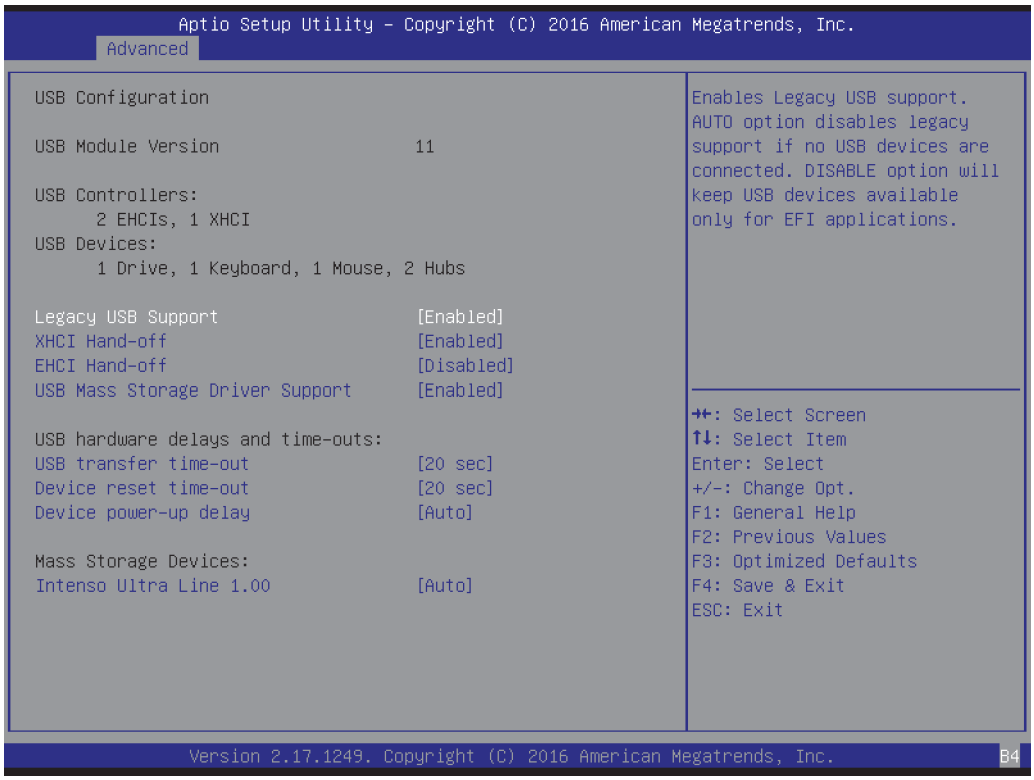
Parameter	Value	Comment
Network Stack	**Enabled** Disabled	Enable/Disable UEFI Network Stack.
Ipv4 PXE Support	**Enabled** Disabled	Enable Ipv4 PXE Boot Support. If disabled IPV4 PXE boot option will not be created.
Ipv6 PXE Support	**Enabled** Disabled	Enable Ipv6 PXE Boot Support. If disabled IPV6 PXE boot option will not be created.
PXE boot wait time	0 ... 5 (**0** default)	Wait time to press ESC key to abort the PXE boot.
Media detect count	1 ... 50 (**1** default)	Number of times presence of media will be checked.

CSM Configuration



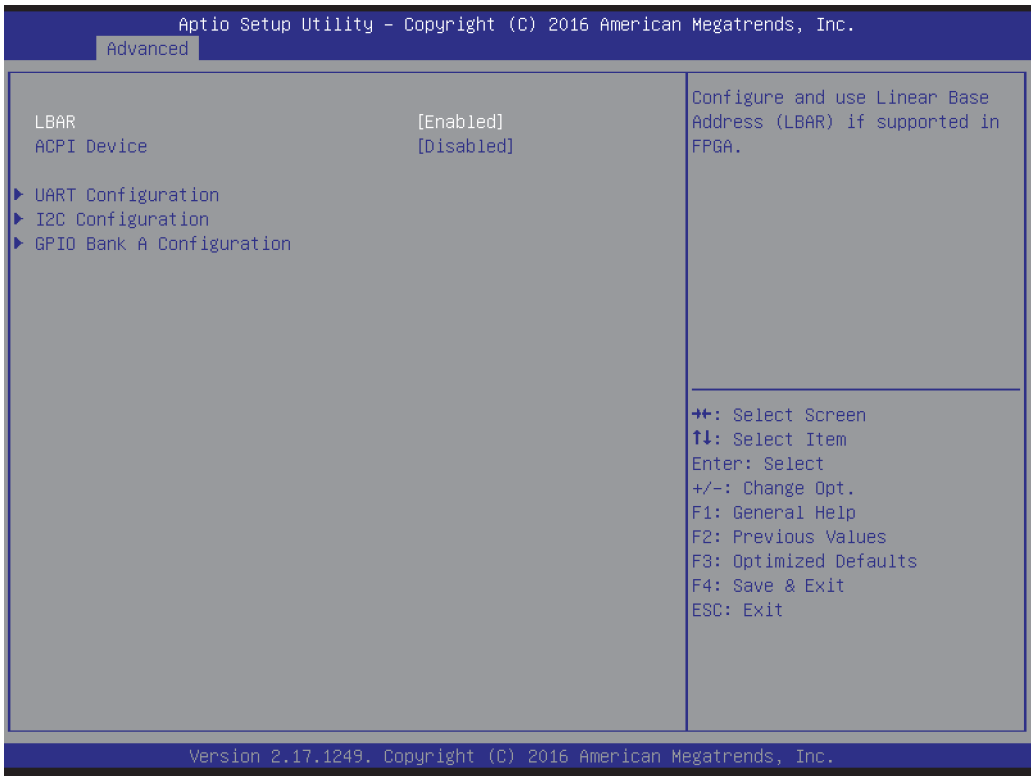
Parameter	Value	Comment
CSM Support	**Enabled** Disabled	Enable/Disable CSM Support.
Option ROM Messages	**Force BIOS** Keep Current	Force BIOS: Change display to text mode and show OpROM messages. Keep Current: Don't change display mode and suppress legacy OpROM messages.
Boot Option Filter	**UEFI and Legacy** Legacy only UEFI only	Configure available boot options.
Network	**Do not launch** UEFI Legacy	Controls the execution of UEFI and Legacy PXE 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.

USB Configuration



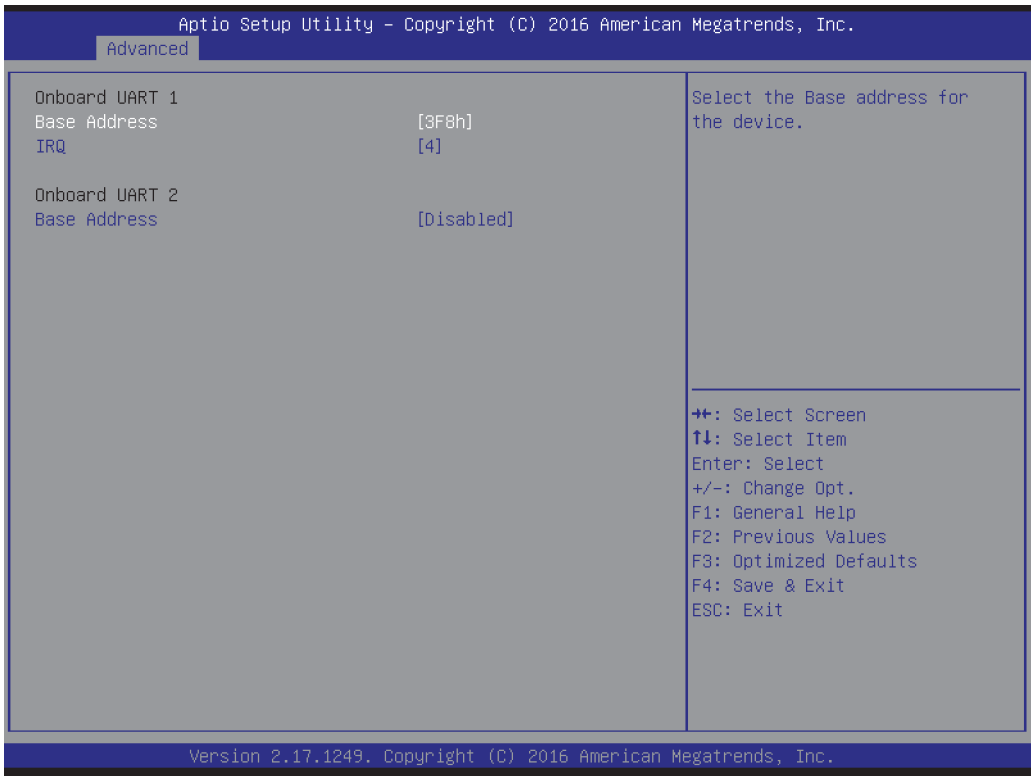
Parameter	Value	Comment
Legacy USB Support	**Enabled** Disabled Auto	Enables Legacy USB support. Disabled: Keep USB devices available only for EFI applications. Auto: Disables legacy support if no USB devices are connected.
XHCI Hand-off	**Enabled** Disabled	This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.
EHCI Hand-off	Enabled **Disabled**	This is a workaround for OSes without EHCI hand-off support. The EHCI ownership change should be claimed by EHCI driver.
USB Mass Storage Driver Support	**Enabled** Disabled	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.
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	1 ... 40 (**5** default)	Delay range is 1..40 seconds, in one second increments.
Mass Storage Devices	**Auto** Floppy Forced FDD Hard Disk CD-ROM	Mass storage device emulation type. 'AUTO' enumerates devices according to their media format. Optical drives are emulated as 'CD-ROM', drives with no media information will be emulated according to a drive type.

Module Peripherals Configuration



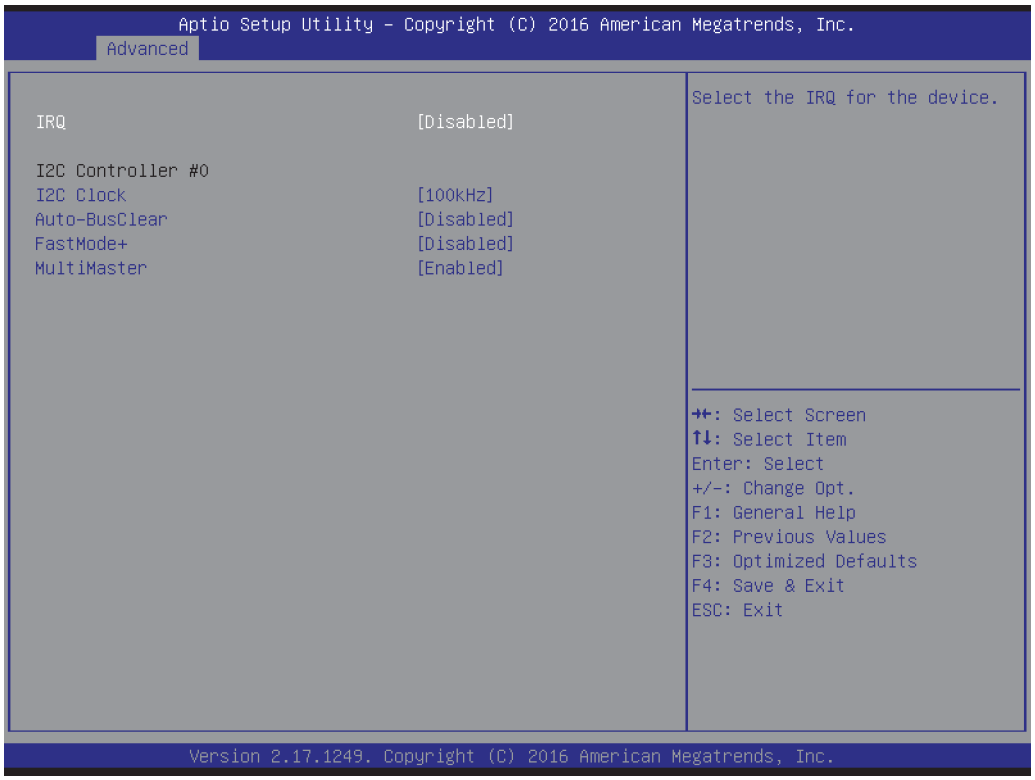
Parameter	Value	Comment
LBAR	**Enabled** Disabled	Configure and use Linear Base Address (LBAR) if supported in FPGA.
ACPI Devices	Enabled **Disabled**	Select how resources are reported to the OS via ACPI. Enabled: Separate device, may require Driver. Disabled: Motherboard Resource.
UART Configuration	Submenu	Configure integrated UARTs.
I2C Configuration	Submenu	Configure integrated I2C controllers.
GPIO Bank A Configuration	Submenu	Configure GPIO Bank A pins.

UART Configuration



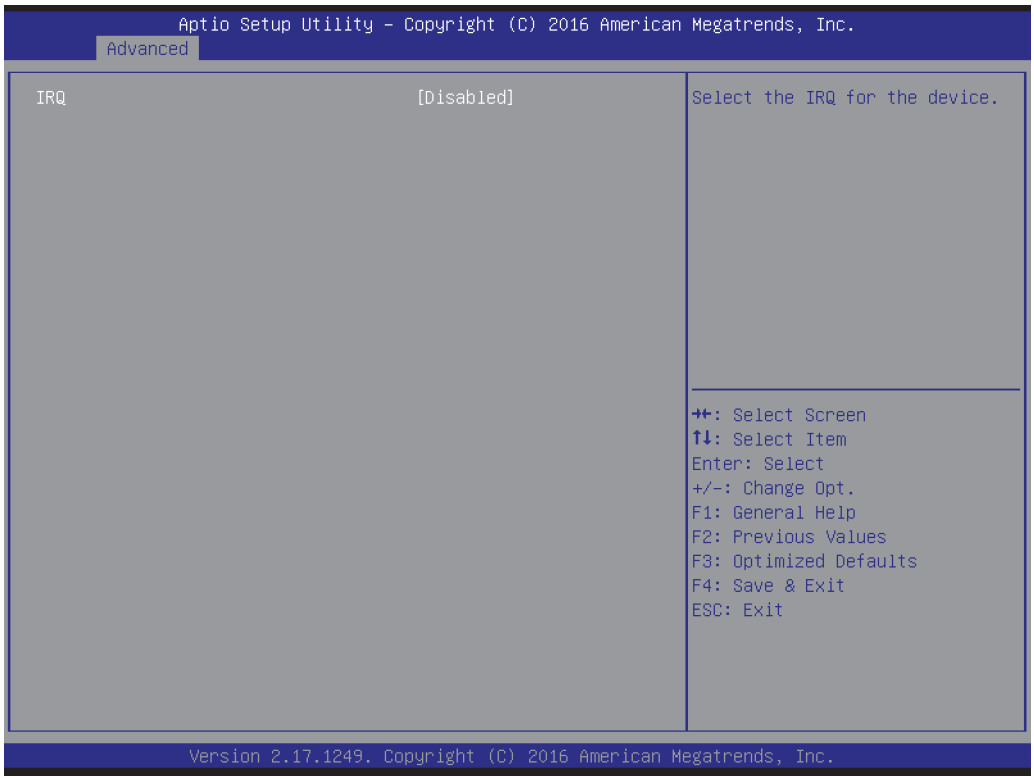
Parameter	Value	Comment
Base Address	**Disabled** 3F8h 2F8h 3E8h 2E8h	Select the Base address for the device.
IRQ	**Disabled** 3, 4, 5, 6, 7, 10, 11, 12, 14, 15	Select the IRQ for the device.

I2C Configuration



Parameter	Value	Comment
IRQ	**Disabled** 3, 4, 5, 6, 7, 10, 11, 12, 14, 15	Select the IRQ for the device.
I2C Clock	1kHz 10kHz 50kHz **100kHz** 200kHz 400kHz 625kHz 800kHz	Select I2C Speed (OS driver may use different speed). Note: Depending on I2C controller, actual speed may be slightly below selected values.
Auto-BusClear	**Disabled** Automatic	If enabled, the I2C controller monitors the SDA line for conditions where the slave device blocks it and tries to recover the bus by pulsing the SCL line. Note: If enabled, the multi-master capability is no longer guaranteed!
FastMode+	Enabled **Disabled**	If enabled, the SCL line is switched from open drain to push-pull to allow for higher speeds. Note: If enabled, multi-master capability and Clock stretching functionality is no longer guaranteed!
MultiMaster	**Enabled** Disabled	If disabled, the I2C master will omit bus arbitration.

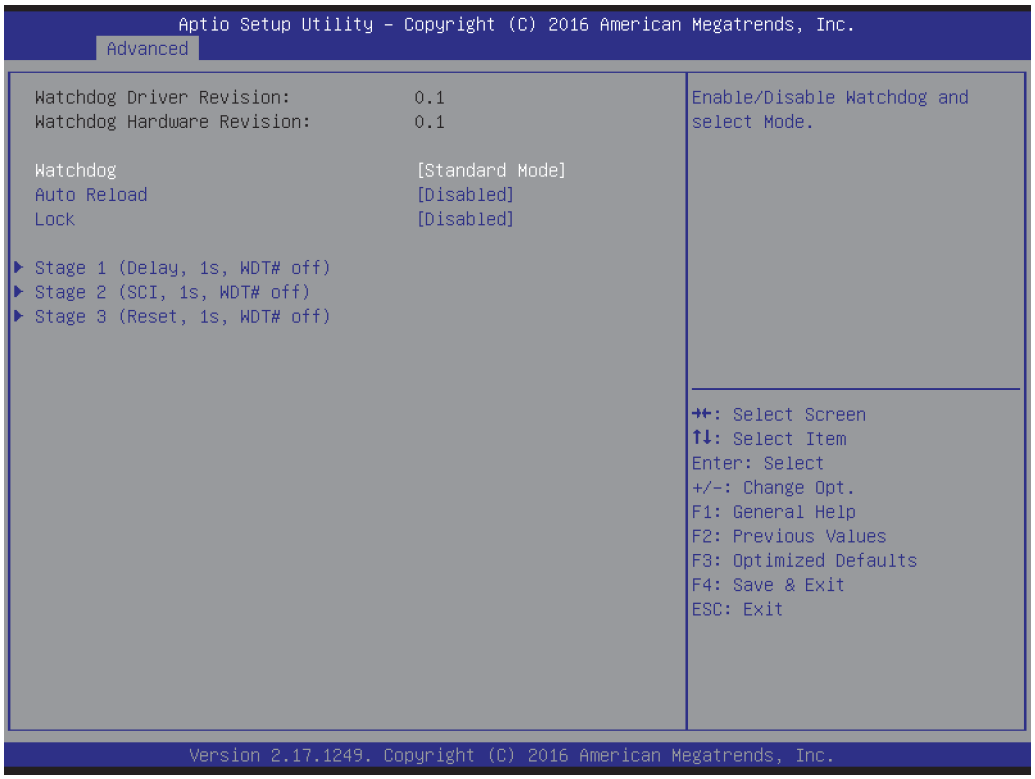
GPIO Configuration



Parameter	Value	Comment
IRQ	**Disabled** 3, 4, 5, 6, 7, 10, 11, 12, 14, 15	Select the IRQ for the device.

Module Watchdog Configuration

Standard Mode

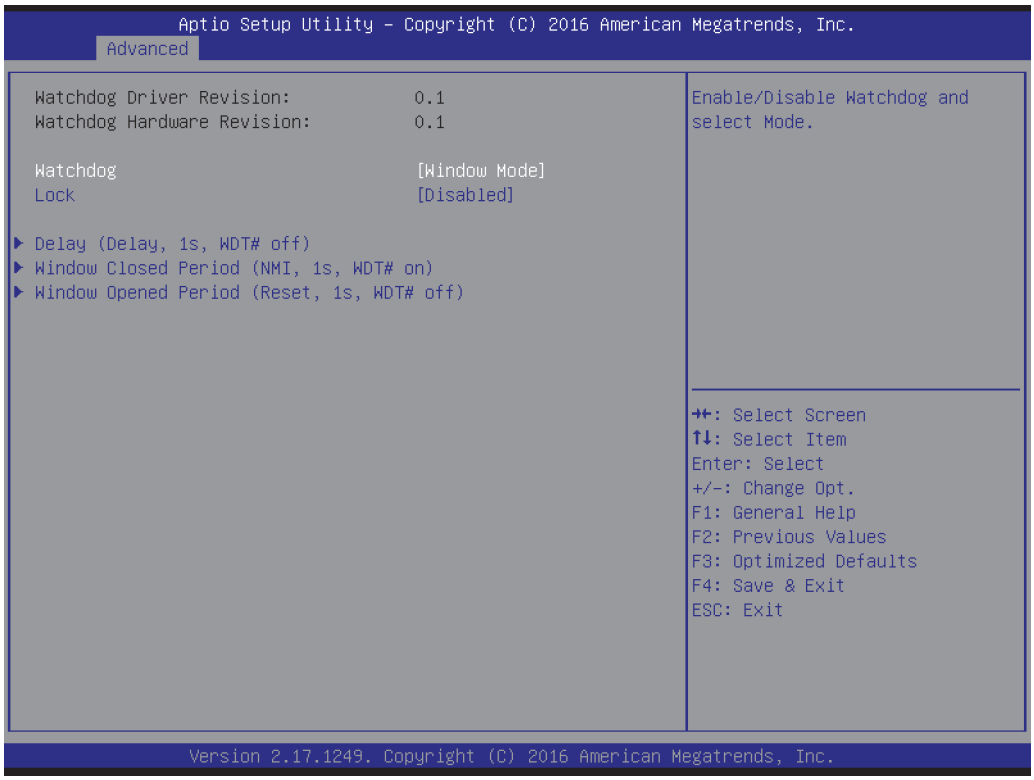


Parameter	Value	Comment
Watchdog	**Disabled** Standard Mode Window Mode	Enable/Disable Watchdog and select Mode.
Auto Reload	Enabled **Disabled**	Enable Auto Reload. If enabled, Timeout registers will be reloaded automatically after expiration.
Lock	Enabled **Disabled**	If enabled, the Watchdog registers will be locked and become read only after initialization.
Stage	Submenu	Configure Watchdog Stage.

Stage Configuration

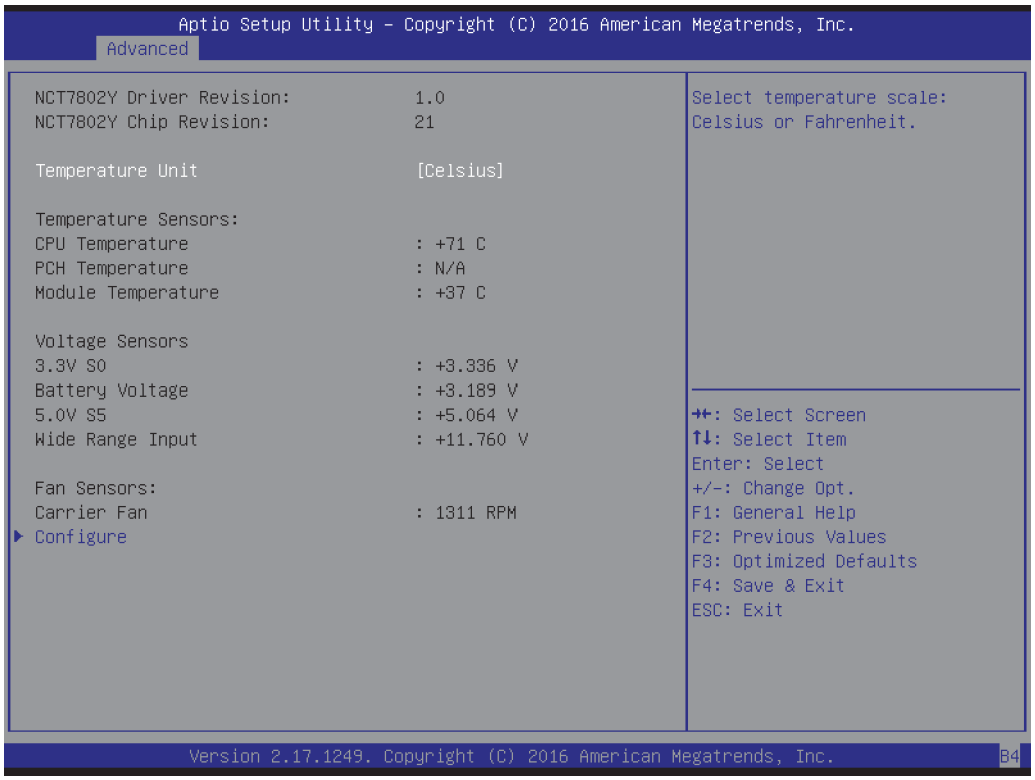
Parameter	Value	Comment
Stage Action	**Delay** Reset NMI SMI SCI IRQ	Select Stage Action on timeout.
Timeout	1 … 65535 (**1** default)	Select the timeout value for the stage.
WDT#	Enabled **Disabled**	If enabled, the Watchdog registers will be locked and become read only after initialization.
Stage	Submenu	Assert WDT# signal to Baseboard.

Window Mode



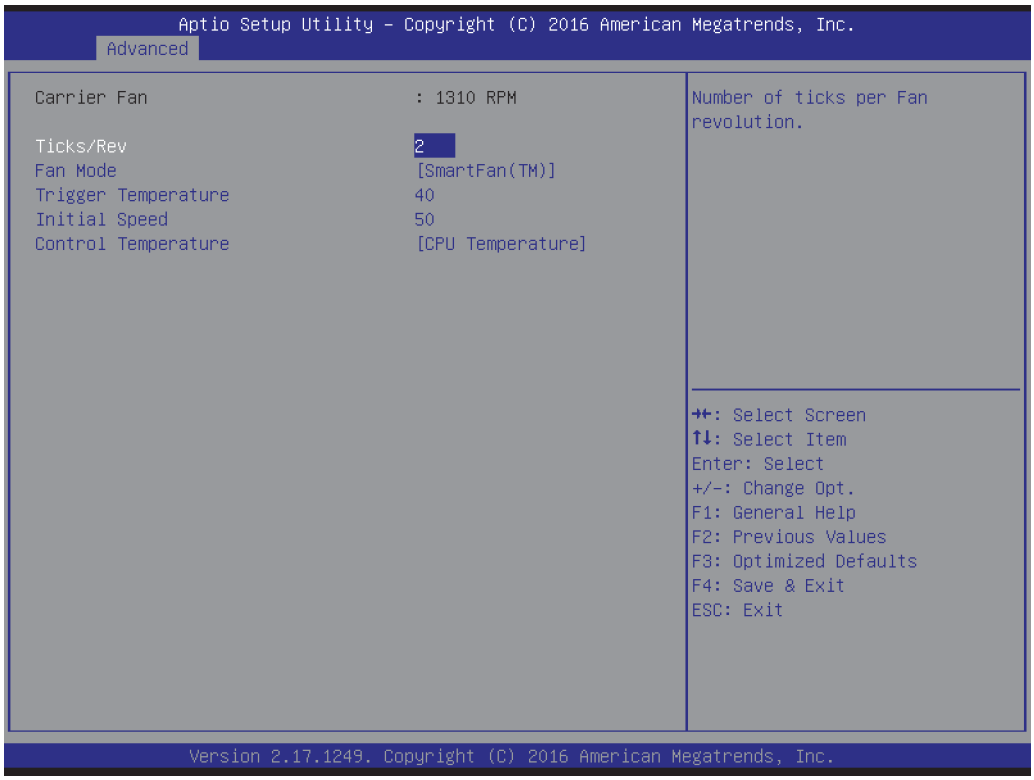
Parameter	Value	Comment
Watchdog	**Disabled** Standard Mode Window Mode	Enable/Disable Watchdog and select Mode.
Lock	Enabled **Disabled**	If enabled, the Watchdog registers will be locked and become read only after initialization.
Delay	Submenu	Enable/Disable Watchdog and select Mode.
Window Closed Period	Submenu	Trigger events during this period will be treated as error and cause the time-out event selected in the Window Open Stage.
Window Opened Period	Submenu	Trigger events during this period will reload the watchdog timer and transition the internal state machine to the Window Closed Stage.

Module H/W Monitor



Parameter	Value	Comment
Temperature Unit	**Celsius** Fahrenheit	Select temperature scale: Celsius or Fahrenheit.
Configure Fan Sensors	Submenu	Configure Fan parameters.

Fan Configuration



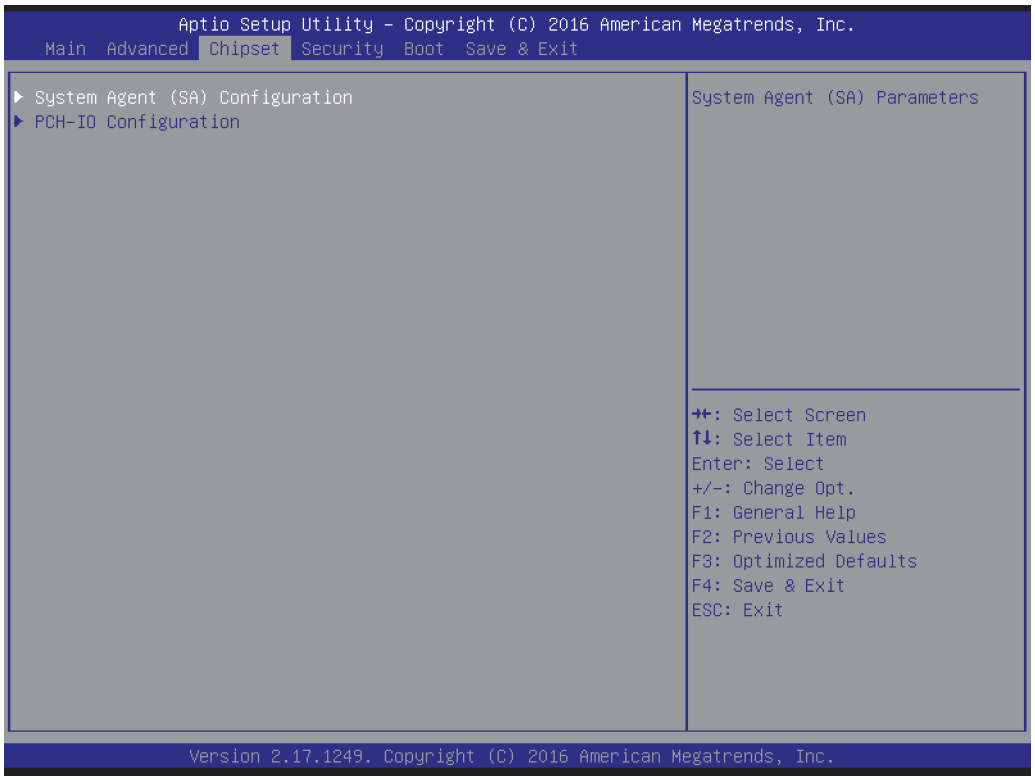
Parameter	Value	Comment
Ticks/Rev	1 ... 16 (**2** default)	Number of ticks per Fan revolution.
Fan Mode	Off Manual **SmartFan(TM)**	Select Fan mode of operation.
Fan Speed	10 ... 100 (**40** default)	Select fixed Fan Speed in %.
Trigger Temperature	Celsius: 20 ... 80 (**40** default) **Fahrenheit:** 68 ... 176 (**104** default)	Select the temperature at which the Fan starts spinning.
Initial Speed	10 ... 80 (**50** default)	Initial Fan Speed in %.
Control Temperature	**CPU Temperature** PCH Temperature Module Temperature	Temperature to use.

Module Display Configuration

Parameter	Value	Comment
Primary IGFX Boot Display	**Auto** CRT LFP EFP1 EFP2 EFP3	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.
Secondary IGFX Boot Display	**Disabled** CRT LFP EFP1 EFP2 EFP3	Select Secondary Display Device.
LFP Panel Type	**Auto** LVDS EEPROM Carrier EEPROM Module EERPOM 640x480 800x600 ...	Select LFP timings used by Internal Graphics Device. LVDS, Carrier and Module EEPROM timings are available if appropriate data is found.
LFP Fallback Type	**Disabled** 640x480 800x600 ...	Enable LFP with selected timings if auto detection fails.
Backlight Type	None **PWM** PWM Inverted I2C I2C Inverted	Select Backlight Inverter Type and Polarity.
Backlight Value	0 ... 100 (**50** default)	Set Backlight Value in Percentage.
PWM Frequency	200 ... 40000 (**200** default)	Set PWM Frequency in Hz.
Backlight On	**Enabled** At the End of Post	Configure if LVDS Backlight should be set when panel is powered, or inhibit until End Of Post.
Backlight OS Controlled	**Enabled** Disabled	Configure if PWM values can be overridden by OS Power Options.

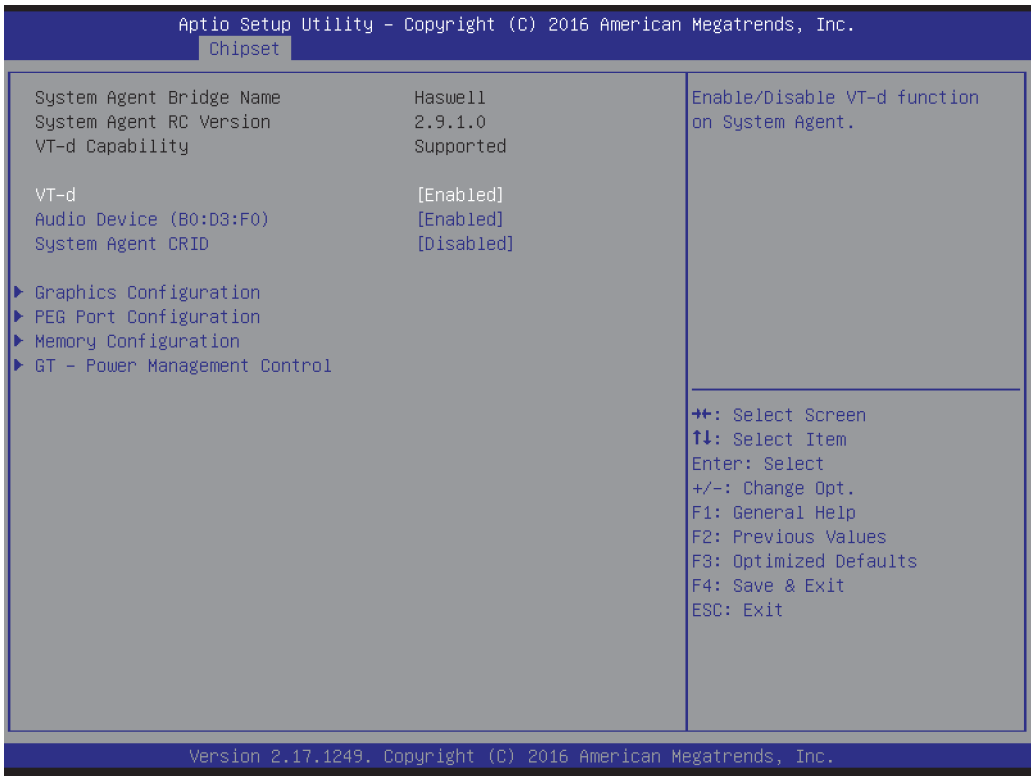
Parameter	Value	Comment
LVDS Spread Spectrum	Disabled 0.5 % 1.0 % 1.5 % 2.0 % 2.5 %	Set LVDS Center Spreading.
EFP Type	HDMI/DVI **DP w. HDMI/DVI Comp.** DP only	Select the type of the EFP.

Chipset



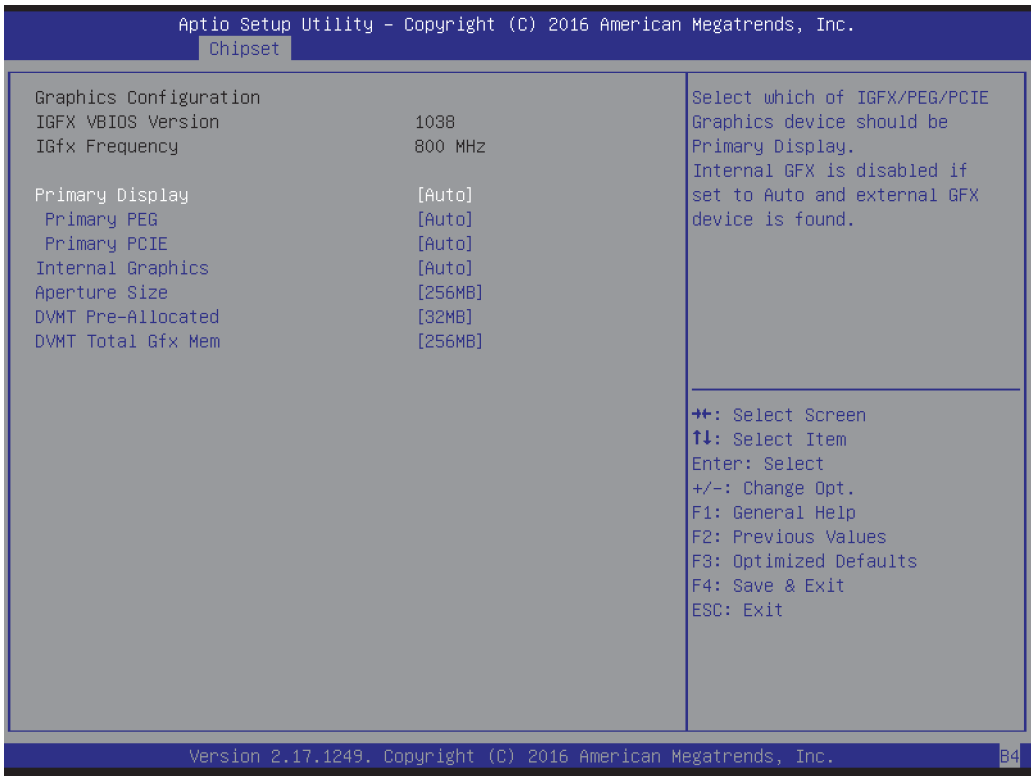
Parameter	Value	Comment
System Agent (SA) Configuration	Submenu	System Agent (SA) Parameters (Graphics, Graphics Audio, DMI, PEG, Memory)
PCH-IO Configuration	Submenu	Platform Controller Hub Parameters

System Agent Configuration



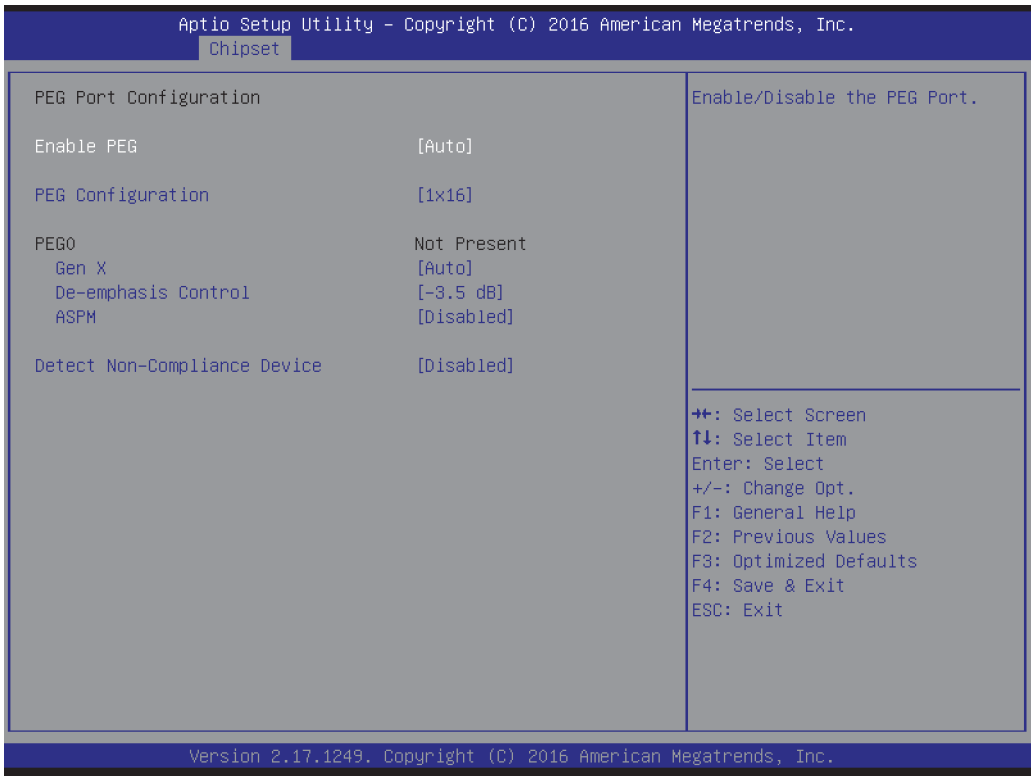
Parameter	Value	Comment
VT-d	**Enabled** Disabled	Enable/Disable VT-d function on System Agent.
Audio Device (B0:D3:F0)	**Enabled** Disabled	Enable/Disable System Agent Audio Device.
System Agent CRID	Enabled **Disabled**	Enable/Disable Compatible Revision ID.
Graphics Configuration	Submenu	Configure Graphics Settings.
PEG Port Configuration	Submenu	Configure System Agent PCI Express Settings.
Memory Configuration	Submenu	Memory Configuration Parameters
GT – Power Management Control	Submenu	GT – Power Management Control Options

Graphics Configuration



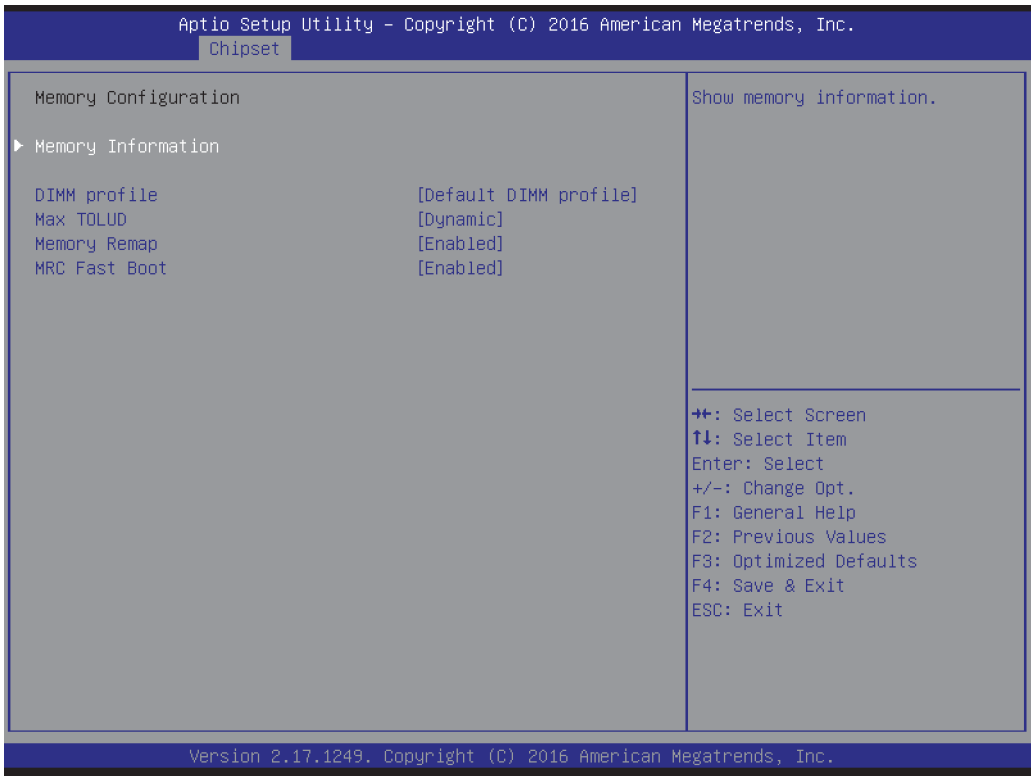
Parameter	Value	Comment
Primary Display	**Auto** IGFX PEG PCIE	Select which of IGFX/PEG/PCIE Graphics device should be Primary Display. Internal GFX is disabled if set to Auto and external GFX device is found.
Primary PEG	**Auto** PEG1 PEG2	Select PEG Graphics device which should be Primary.
Primary PCIE	**Auto** PCIE1 ... PCIE7	Select PCIE Graphics device that should be Primary.
Internal Graphics	**Auto** Enabled Disabled	Keep IGD enabled based on the setup options.
Aperture Size	128MB ... 4096MB (**128MB** default)	Select the Aperture Size. Note: Above 4GB MMIO BIOS assignment is automatically enabled when selecting more than 1GB aperture. To use this feature, please disable CSM Support.
DVMT Pre-Allocated	32MB ... 1024MB (**32MB** default)	Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.
DVMT Total Gfx Mem	128MB **256MB** MAX	Select DVMT5.0 Total Graphic Memory size used by the Internal Graphics Device.

PEG Port Configuration



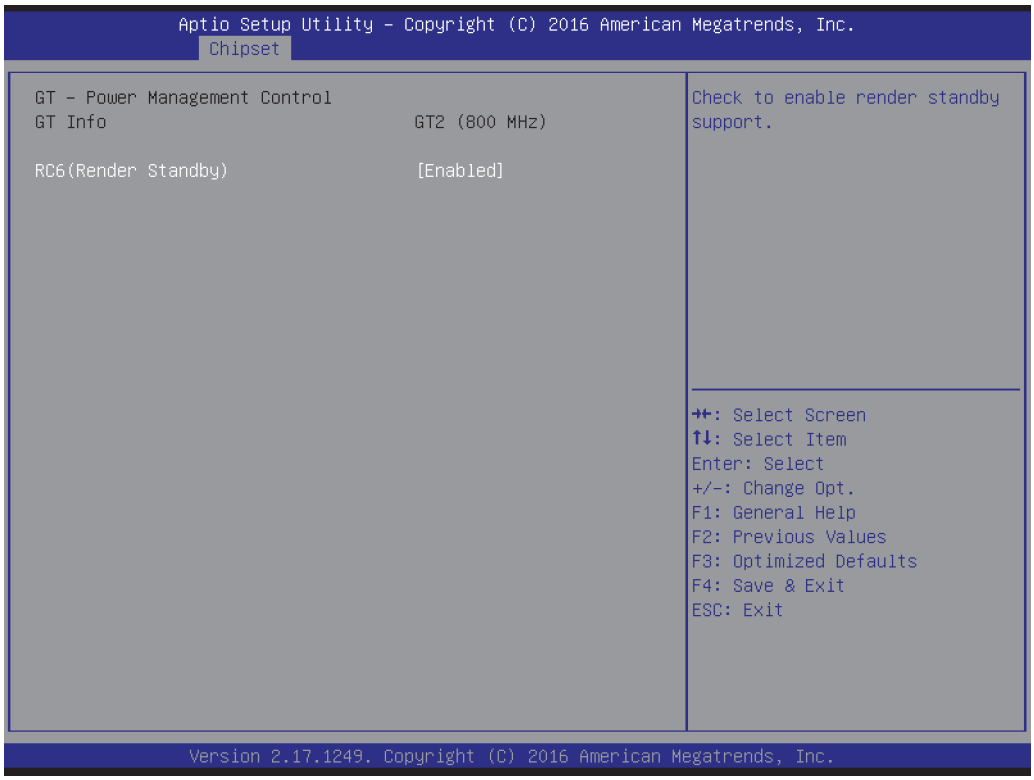
Parameter	Value	Comment
Enable PEG	**Auto** Enabled Disabled	Enable/Disable the PEG Port.
PEG Configuration	**1x16** 2x8 1x8 + 2x4	Select PEG port link width configuration.
Gen X	**Auto** Gen1 Gen2 Gen3	Configure PEG Generation.
De-emphasis Control	-6 dB **-3.5 dB**	Configure the De-emphasis control on PEG.
ASPM	Enabled **Disabled**	Control ASPM support for the PEG Device. This has no effect if PEG is not the currently active device.
ASPM L0sM	RP EP **RP+EP**	Enable ASPM L0s for Rootport (RP) and/or Endpoint (EP).
Program PCIe ASPM after OpROM	Enabled **Disabled**	Enabled: PCIe ASPM will be programmed after OpROM execution. Disabled: PCIe ASPM will be programmed before OpROM execution.
Detect Non-Compliance Device	**Enabled** Disabled	Detect Non-Compliance PCI Express Device in PEG Port.

Memory Configuration



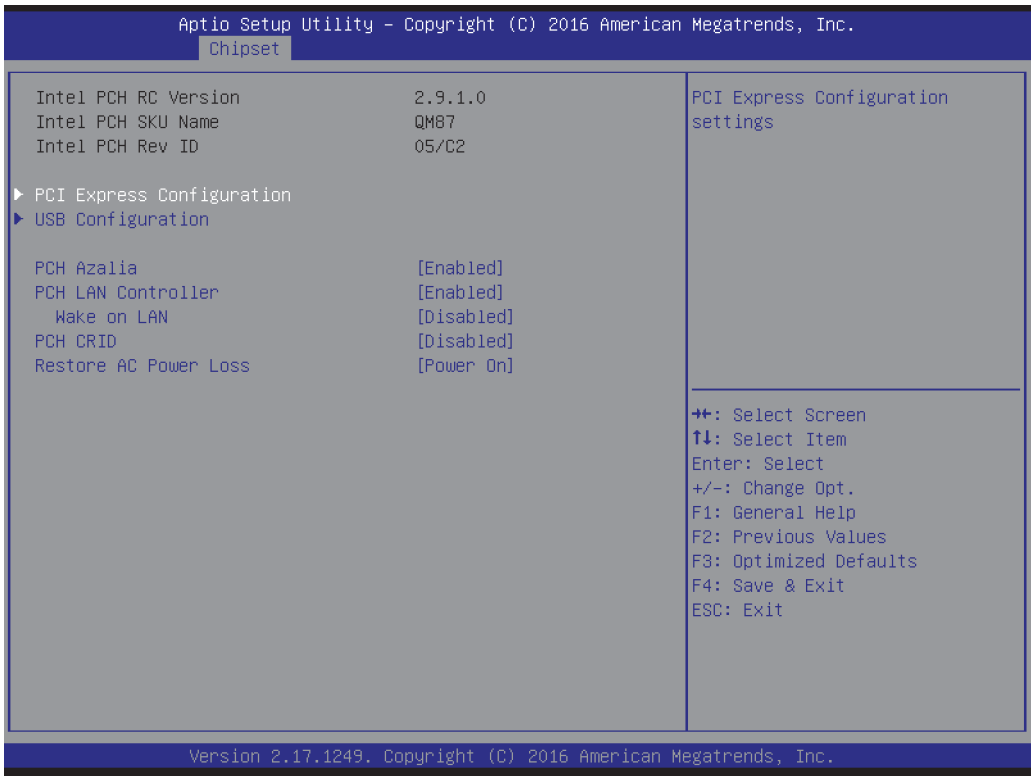
Parameter	Value	Comment
Memory Information	Submenu	Show memory information.
DIMM profile	**Default DIMM** XMP Profile 1 XMP Profile 2	Select DIMM timing profile that should be used.
Max TOLUD	**Dynamic** 1 GB 1.25 GB 1.5 GB 1.75 GB 2 GB 2.25 GB 2.5 GB 2.75 GB 3 GB 3.25 GB	Maximum Value of TOLUD. Dynamic assignment would adjust TOLUD automatically based on largest MMIO length of installed graphic controller.
Memory Remap	**Enabled** Disabled	Enable/Disable memory remap above 4GB.
MRC Fast Boot	**Enabled** Disabled	Enable/Disable MRC fast boot. Skips memory training if memory configuration not changed.

GT - Power Management Control



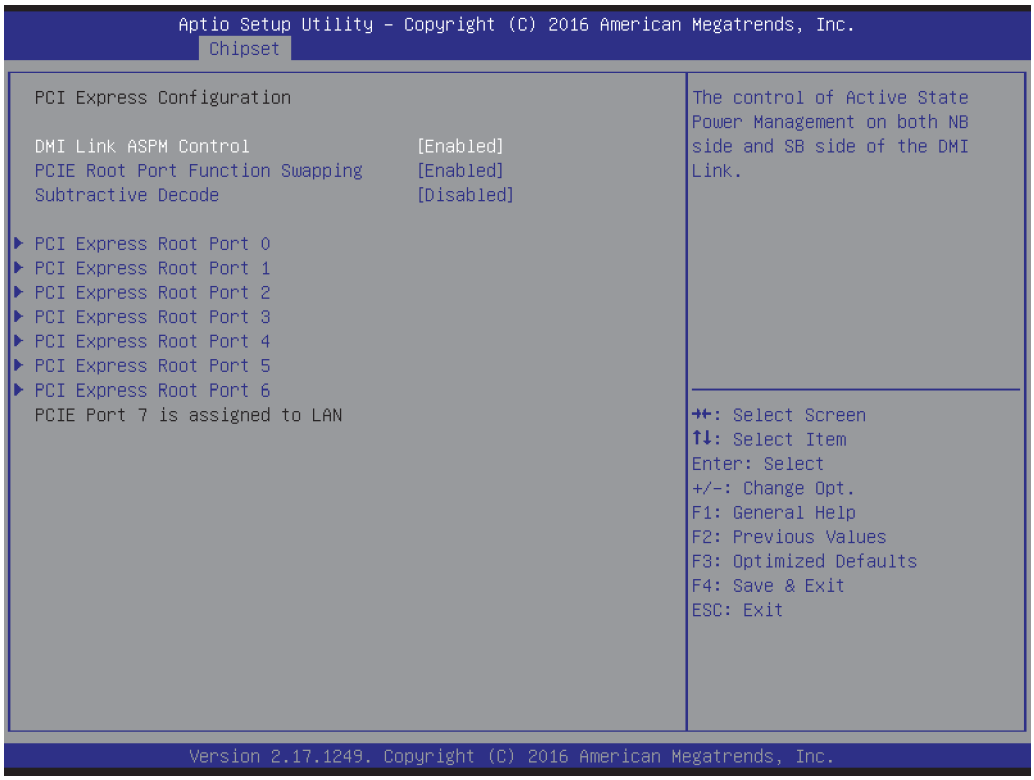
Parameter	Value	Comment
RC6 (Render Standby)	**Enabled** Disabled	Enable/Disable render standby support.

PCH-IO Configuration



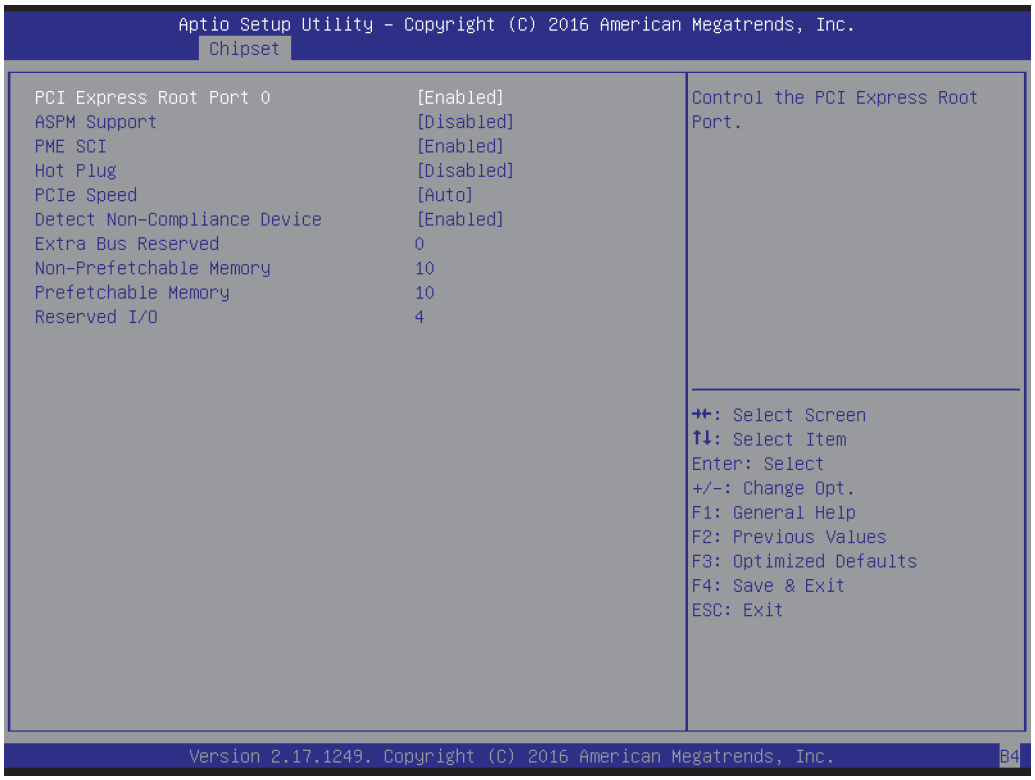
Parameter	Value	Comment
PCI Express Configuration	Submenu	PCI Express Configuration settings
USB Configuration	Submenu	USB Configuration settings
PCH Azalia	**Enabled** Disabled Auto	Control Detection of the Azalia HDA device (High Definition Audio). Disabled = Azalia will be unconditionally disabled. Enabled = Azalia will be unconditionally Enabled. Auto = Azalia will be enabled if present, disabled otherwise.
PCH LAN Controller	**Enabled** Disabled	Enable or disable onboard NIC.
Wake on LAN	Enabled **Disabled**	Enable or disable integrated LAN to wake the system.
PCH CRID	Enabled **Disabled**	Enable or disable PCH Compatible Revision ID.
Restore AC Power Loss	Power Off **Power On** Last State	Select AC power state when power is re-applied after a power failure.

PCI Express Configuration



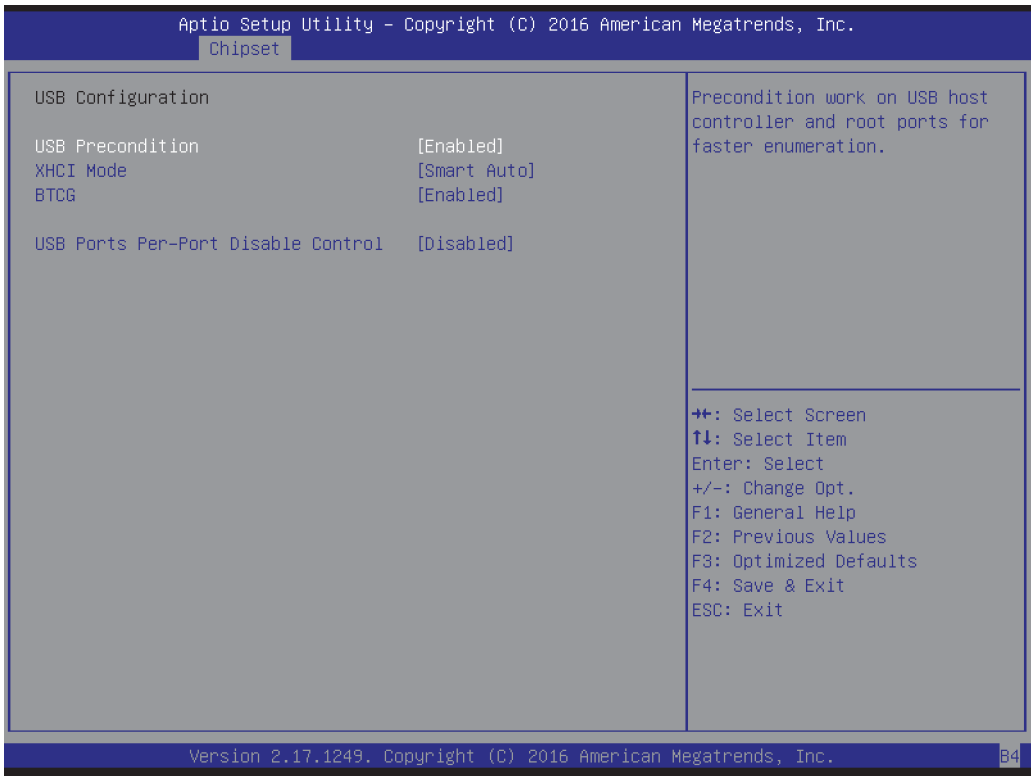
Parameter	Value	Comment
DMI Link ASPM Control	**Enabled** Disabled	The control of Active State Power Management on both NB side and SB side of the DMI Link.
PCIE Root Port Function Swapping	**Enabled** Disabled	Enable or disable PCI Express PCI Express Root Port Function Swapping.
Subtractive Decode	Enabled **Disabled**	Enable or disable PCI Express Subtractive Decode.
Subtractive Decode Port#	0 ... 7 (**0** default)	Select PCI Express Subtractive Decode Root Port.
PCI Express Root Port	Submenu	PCI Express Root Port Settings.

PCI Express Root Port



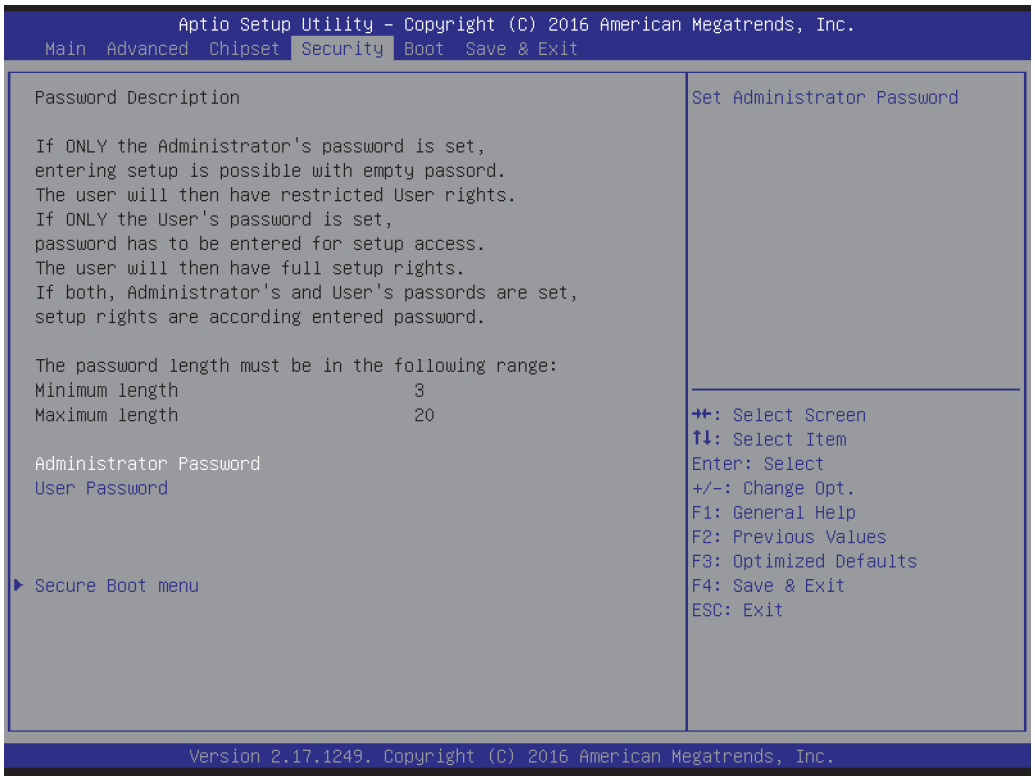
Parameter	Value	Comment
PCI Express Root Port	**Enabled** Disabled	Control the PCI Express Root Port.
ASM Support	**Disabled** L0s L1 L0sL1 Auto	Set the ASPM Level: Force all links to appropriate ASPM state, or Auto negotiate ASPM configuration or Disable ASPM.
PME SCI	**Enabled** Disabled	Enable or disable PCI Express Power management System Control Interrupt.
Hot Plug	Enabled **Disabled**	Enable or disable PCI Express Hot Plug.
PCIe Speed	**Auto** Gen1 Gen2	Select PCI Express Port speed.
Detect Non-Compliance Device	**Enabled** Disabled	Detect Non-Compliance PCI Express Devices.
Extra Bus Reserved	0 ... 7 (**0** default)	Reserve extra bus (0 ... 7) for bridges behind this Root Bridge.
Non-Prefetchable Memory	1 ... 20 (**10** default)	Non-prefetchable memory in MB for this Root Bridge.
Prefetchable Memory	1 ... 20 (**10** default)	Prefetchable memory in MB for this Root Bridge.
Reserved I/O	1 ... 20 (**4** default)	I/O range (4kB/8kB/12kB/16kb/20kB) for this Root Bridge.

USB Configuration



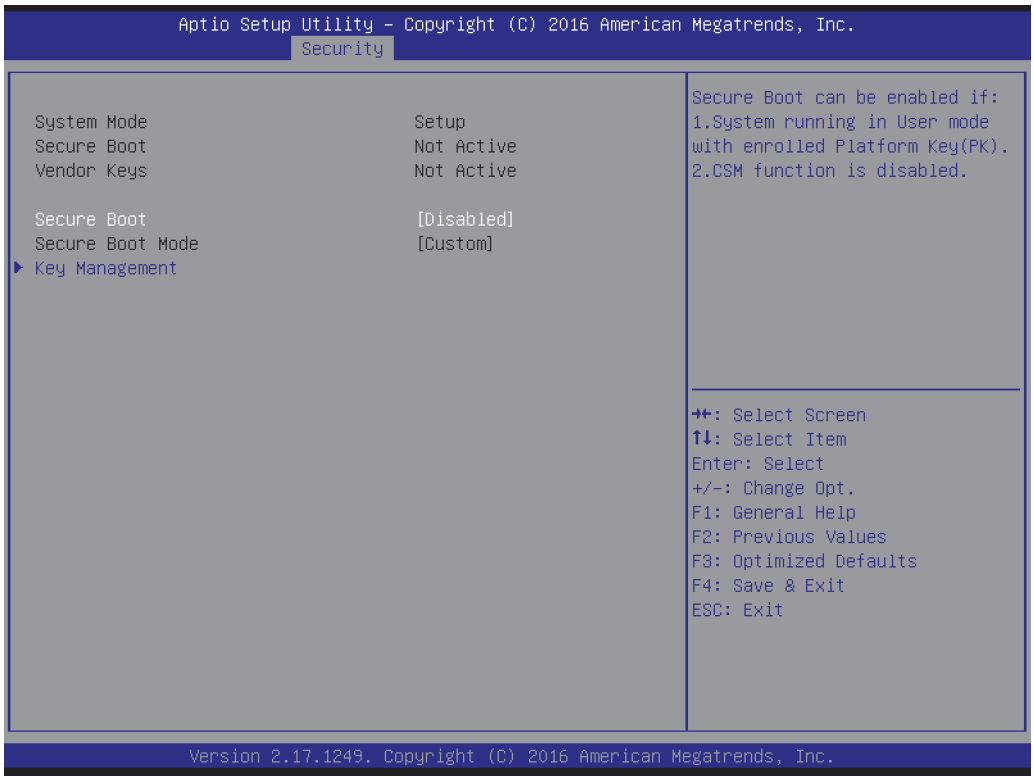
Parameter	Value	Comment
USB Precondition	**Enabled** Disabled	Precondition work on USB host controller and root ports during PEI for faster enumeration.
XHCI Mode	**Smart Auto** Auto Enabled Disable	Auto: Ports function like 2.0 ports. OS driver needs capability to reroute ports to xHCI. Smart Auto: Ports function like 2.0 ports only until OS xHCI driver reroutes them to xHCI. At reboots they are already routed to xHCI. Enabled: OS need xHCI driver support. Disabled: Ports function like 2.0 ports. No xHCI driver support in OS is necessary.
BTCG	**Enabled** Disabled	Enabling/disabling trunk clock gating.
USB Ports Per-Port Disable Control	Enabled **Disabled**	Control disabling of each of the USB Ports.
USB Port	**Enabled** Disabled	Enable/disable USB Port.

Security



Parameter	Value	Comment
Administrator Password		Set Administrator Password.
User Password		Set User Password.
Secure Boot menu	Submenu	Customizable Secure Boot settings

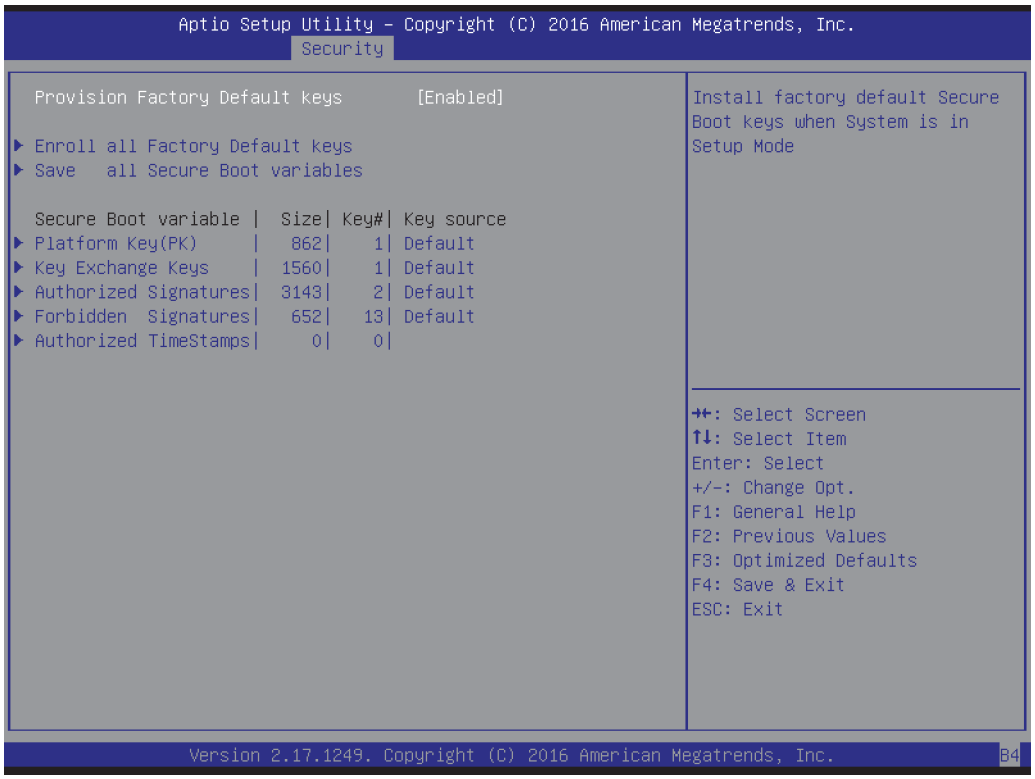
Secure Boot Configuration



Parameter	Value	Comment
Secure Boot	**Enabled** Disabled	Secure Boot can be enabled if: 1. System running in User mode with enrolled Platform Key(PK). 2. CSM function is disabled.
Secure Boot Mode	Standard **Custom**	Secure Boot mode selector. 'Custom' Mode enables users to change Image Execution policy and manage Secure Boot Keys.
Key Management	Submenu	Secure Boot variables management.

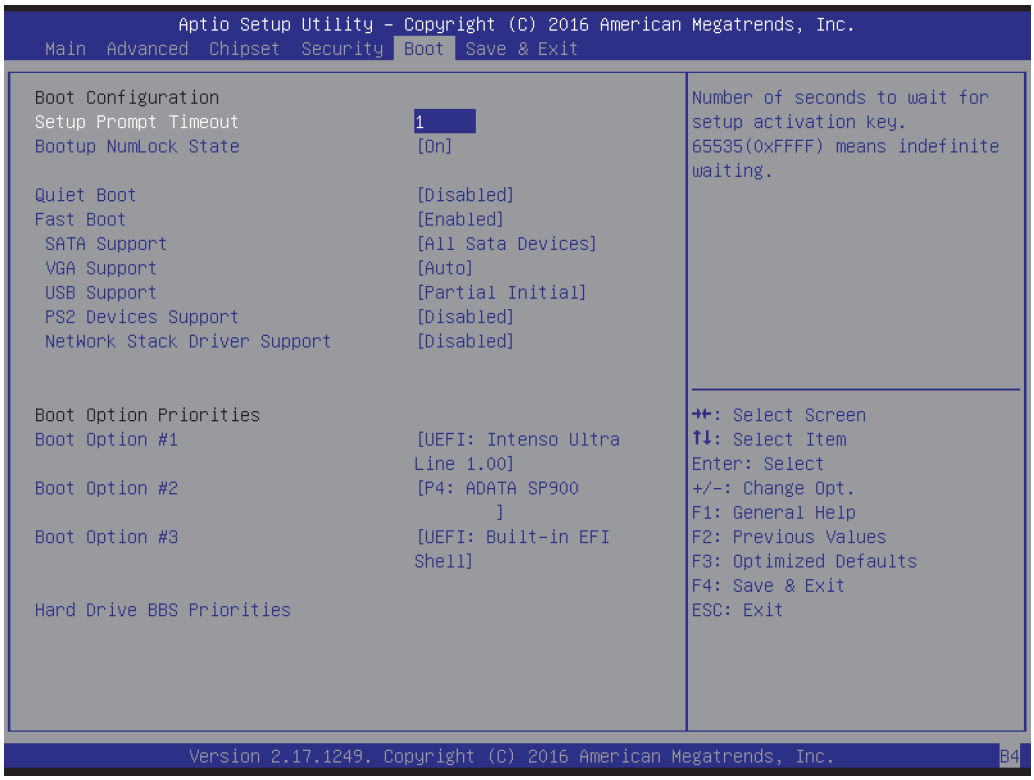
Key Management

Note: Default Secure Variables PK, KEK, db and dbx should updated and signed by OEM PK/KEK Keys.



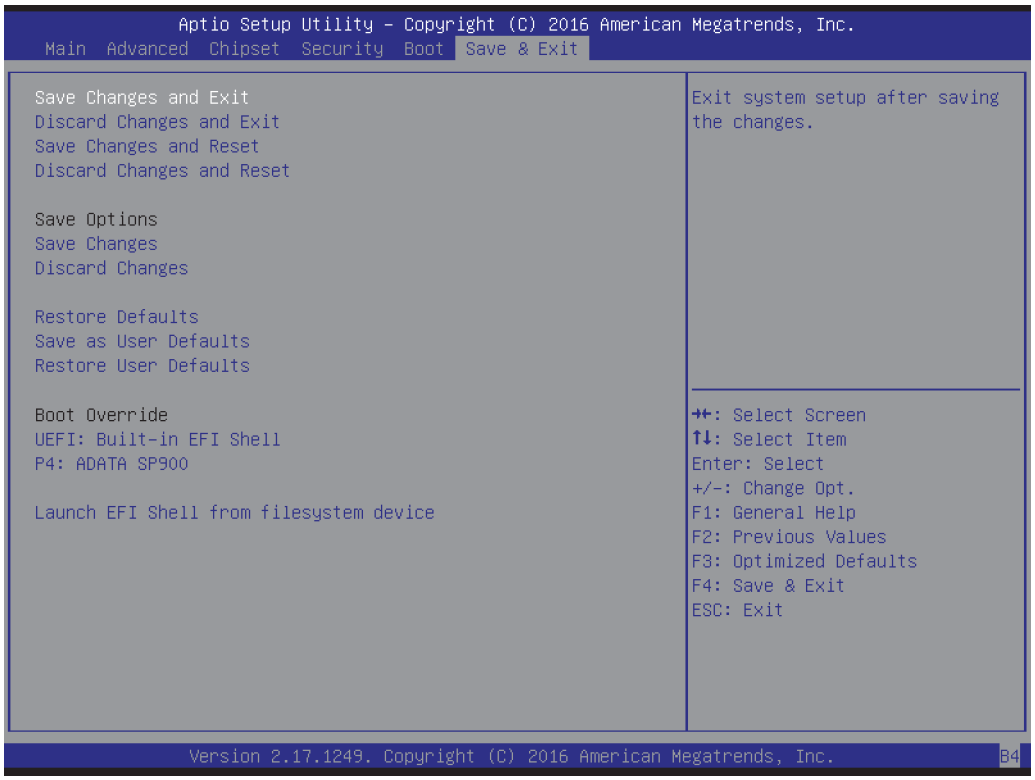
Parameter	Value	Comment
Provision Factory Default keys	Enabled **Disabled**	Install factory default Secure Boot keys when System is in Setup Mode.
Delete all Secure Boot variables	Function Key	Force System to Setup Mode - clear all Secure Boot Variables (PK, KEK, db, dbt, dbx). Change takes effect after reboot.
Enroll all Factory Default keys	Function Key	Force System to User Mode - install all Factory Default keys (PK, KEK, db, dbt, dbx). Change takes effect after reboot.
Save all Secure Boot variables	Function Key	Save NVRAM content of all Secure Boot variables to the files (EFI_SIGNATURE_LIST data format) in root folder on a target file system device.
Platform Key (PK)	Function Key	Enroll Factory Defaults or load the keys from a file with: 1.Public Key Certificate in: a)EFI_SIGNATURE_LIST b)EFI_CERT_X509 (DER encoded) c)EFI_CERT_RSA2048 (bin) d)EFI_CERT_SHA256 (bin) 2.Authenticated UEFI Variable Key source: Default, Custom, Mixed (*) modified from Setup menu
Key Exchange Keys (KEK)	Function Key	
Authorized Signatures	Function Key	
Forbidden Signatures	Function Key	
Authorized TimeStamps	Function Key	

Boot



Parameter	Value	Comment
Setup Prompt Timeout	1 … 65535 (**1** default)	Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.
Bootup NumLock State	**On** Off	Select the keyboard NumLock state.
Quiet Boot	Enabled **Disabled**	Enables or disables Quiet Boot option.
Fast Boot	Enabled **Disabled**	Enables/disables boot with initialization of a minimal set of devices required to launch active boot option.
SATA Support	Last Boot HDD Only **All SATA Devices**	Select if only last HDD booted or all SATA HDD should be initialized.
VGA Support	Auto **EFI Driver**	If Auto, only install Legacy OpROM with Legacy OS. 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 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 Device Support	Enabled **Disabled**	If Disabled, PS2 devices will be skipped.
Network Stack Driver Support	Enabled **Disabled**	Sets the boot order. Priority of devices from same type can be selected in BBS priority menus.
Boot Option Priorities	Depends on recognized devise	Sets the boot order. Priority of devices from same type can be selected in BBS priority menus.
Hard Drive BBS Priorities	Submenu	Set the order of the legacy devices in this group. Content depend on recognized devices.

Save & Exit



Parameter	Value	Comment
Save Changes and Exit	Function Key	Exit system setup after saving the changes.
Discard Changes and Exit	Function Key	Exit system setup without saving any changes.
Save Changes and Reset	Function Key	Reset the system after saving the changes.
Discard Changes and Reset	Function Key	Reset system setup without saving any changes.
Save Changes	Function Key	Save Changes done so far to any of the setup options.
Discard Changes	Function Key	Discard Changes done so far to any of the setup options.
Restore Defaults	Function Key	Restore/Load Default values for all the setup options.
Save as User Defaults	Function Key	Save the changes done so far as User Defaults.
Restore User Defaults	Function Key	Restore the User Defaults to all the setup options.
Boot Override	Depends on recognized devise	Boots to selected device.
Launch EFI Shell from filesystem device	Function Key	Attempts to Launch EFI Shell application (Shell.efi) from one of the available filesystem devices.

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