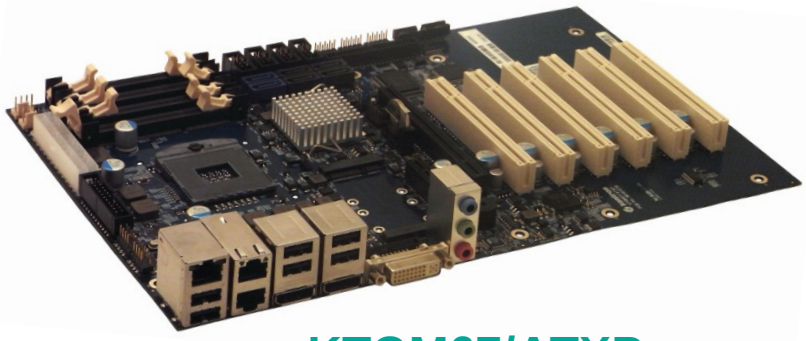
» Kontron User's Guide «

KTQM67/mITX

KTQM67/Flex



KTQM67/ATXP

KTQM67 Users Guide

KTD-N0819-G

Document revision history.

Revision	Date	By	Comment
G	July 10th 2012	MLA	Added USB port/EHCI relation. Added normal beep info. Added info about backside label. Ivy Bridge support added. Note for support of PCIe x2.
F	May 18th 2012	MLA	Added notes in chapter Power Consumption. Correction of EDP connector pin order. Added info, miniPCIe USB signals not supported. Added OS support. Added DP extension cable. SPI Recovery procedure improved. BIOS part added. Chapter 9 tables finished.
E	Jan 19th 2012	MLA	Correction to SPI description. Added information about Processor dependent support of SODIMM slots. Changed SODIMM numbers.
D	Dec 28th 2011	MLA	Sspec no. correction. Added i3-2320E. LPT not on mITX. Added SPI connector details. Added KTQM67/ATXP pictures and related data.
A -C	Aug 16th 2011	MLA	Comments removed in revision G.
0	Jun 8th 2011	MLA	Preliminary version

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- CPU Board
  1. Type.
  2. Part Number (find PN on label)
  3. Serial Number if available (find SN on label)
- Configuration
  1. CPU Type, Clock speed
  2. DRAM Type and Size.
  3. BIOS Revision (Find the Version Info in the BIOS Setup).
  4. BIOS Settings different than *Default* Settings (Refer to the BIOS Setup Section).
- System
  1. O/S Make and Version.
  2. Driver Version numbers (Graphics, Network, and Audio).
  3. Attached Hardware: Harddisks, CD-rom, LCD Panels etc.

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2. ANY OTHER DAMAGES, WHETHER INCIDENTAL, CONSEQUENTIAL OR OTHERWISE.
3. ANY CLAIM AGAINST THE CUSTOMER BY ANY OTHER PARTY.

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Introduction

This manual describes the KTQM67/mITX, KTQM67/Flex and KTQM67/ATXP boards made by KONTRON Technology A/S. The boards will also be denoted KTQM67 family if no differentiation is required.

The KTQM67 boards, all based on the QM67 chipset, support 2nd and 3rd generation Intel® i7 -, i5 -, i3 2Core and 4Core processor and the Celeron B810 2Core, see “Processor Support Table for more specific details.

The KTQM67 family consist on members having different form factors, and the same functionality except for the functions listed in the table below.

KTQM67 variants	Format	PCI	LPT	SODIMM Sockets	Single +12V Power Supply
KTQM67/mITX	mITX	-	-	2	Yes
KTQM67/Flex	Flex	3	1	4	No
KTQM67/ATXP	ATX	6	1	4	No

Use of this Users Guide implies a basic knowledge of PC-AT hard- and software. This manual is focused on describing the KTQM67 board’s special features and is not intended to be a standard PC-AT textbook.

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

All configuration and setup of the CPU board is either done automatically or manually by the user via the CMOS setup menus. Only exception is the Clear CMOS jumper.

1 Installation procedure

1.1 Installing the board

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

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

Warning: Turn off PSU (Power Supply Unit) completely (no mains power connected to the PSU) or leave the Power Connectors unconnected while configuring the board. Otherwise components (RAM, LAN cards etc.) might get damaged. If not using KTQM67/mITX and single 12V power input make sure PSU has 3.3V monitoring watchdog (standard ATX PSU feature), running the board without 3.3V will damage the board within minutes.

2. **Insert the DDR3 DIMM 204pin SODIMM module(s)**
   Be careful to push it in the slot(s) before locking the tabs. For a list of approved DDR3 SODIMMs contact your Distributor or FAE. See also chapter “System Memory Support”.

3. **Install the processor**
   The CPU is keyed and will only mount in the CPU socket in one way. Use suitable screwdriver to open/ close the CPU socket. Refer to supported processor overview for details.

4. **Cooler Installation**
   Use heat paste or adhesive pads between CPU and cooler and connect the Fan electrically to the FAN_CPU connector.

5. **Connecting Interfaces**
   Insert all external cables for hard disk, keyboard etc. A monitor must be connected in order to be able change CMOS settings.

6. **Connect and turn on PSU**
   Connect PSU to the board by the ATX/BTXPWR and the 4-pin ATX+12V connectors. For the KTQM67/mITX alternatively use only the 4-pin ATX+12V connector if single voltage operation (+12V +/-5%) is requested.

7. **Power Button**
   The PWRBTN_IN must be toggled to start the Power supply; this is done by shorting pins 16 (PWRBTN_IN) and pin 18 (GND) on the FRONTPNL connector (see Connector description). A “normally open” switch can be connected via the FRONTPNL connector.

8. **BIOS Setup**
   Enter the BIOS setup by pressing the <Del> key during boot up.
   Enter Exit Menu and Load Optimal Defaults.
   Refer to the “BIOS Configuration / Setup“ section of this manual for details on BIOS setup.

Note: To clear all CMOS settings, including Password protection, move the Clear CMOS jumper in the Clear CMOS position (with or without power) for ~10 sec. This will Load Failsafe Defaults and make sure Secure CMOS is disabled.

9. **Mounting the board to chassis**

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

When fixing the Motherboard on a chassis it is recommended using screws with integrated washer and having diameter of ~7mm.

Note: Do not use washers with teeth, as they can damage the PCB and may cause short circuits.

1.2 Requirement according to IEC60950

Users of KTQM67 family boards should take care when designing chassis interface connectors in order to fulfil the IEC60950 standard:

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

To protect the external power lines of the peripheral devices, the customer has to take care about:

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

Lithium Battery precautions:

CAUTION! Danger of explosion if battery is incorrectly replaced. Replace only with same or equivalent type recommended by manufacturer. Dispose of used batteries according to the manufacturer's instructions.	**VORSICHT!** Explosionsgefahr bei unsachgemäßem Austausch der Batterie. Ersatz nur durch den selben oder einen vom Hersteller empfohlenen gleichwertigen Typ. Entsorgung gebrauchter Batterien nach Angaben des Herstellers.
ADVARSEL! Lithiumbatteri – Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.	**ADVARSEL** Eksplosjonsfare ved feilaktig skifte av batteri. Benytt samme batteritype eller en tilsvarende type anbefalt av apparatfabrikanten. Brukte batterier kasseres i henhold til fabrikantens instruksjoner.
VARNING Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.	**VAROITUS** Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laltevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

2 System Specification

2.1 Component main data

The table below summarizes the features of the KTQM67/mITX, KTQM67/Flex and KTQM67/ATXP embedded motherboards.

Form factor	KTQM67/mITX: miniITX (170,18 mm by 170,18 mm) KTQM67/Flex: Flex-ATX (190,5 mm by 228,6 mm) KTQM67/ATXP: ATX (190,5 mm by 304,0 mm)
Processor	Support 2nd and 3rd Generation Intel® Core™ (Sandy Bridge M and Ivy Bridge M respectively) and Intel® Celeron® processors via Socket G2 (rPGA 988B) ZIF Socket • Intel® Core™ i7 • Intel® Core™ i5 • Intel® Core™ i3 • Intel® Celeron® B810 Up to 1333MHz system bus and 2/3/4/6MB internal cache.
Memory	• DDR3 SODIMM 204pin socket (2 sockets on mITX and 4 sockets on Flex/ATXP) • Support single and dual ranks DDR3 1066/1333/1600MT/s (PC3-8500/PC3-10600/PC3-12800) • Support system memory from 256MB and up to 4x 8GB (2x 8GB on mITX). Notes: Only some of the processors support 4 SODIMM slots. Less than 4GB displayed in System Properties using 32bit OS (Shared Video Memory/PCI resources is subtracted) • ECC not supported (PGA processors do not support ECC)
Chipset	Intel QM67 PCH (Platform Controller Hub) • Intel ® VT-d (Virtualisation Technology for Directed I/O) • Intel ® TXT (Trusted Execution Technology) • Intel ® vPRO • Intel ® AMT (Active Management Technology) version 7 • Intel ® AT (Anti-Theft Technology) • Intel ® HD Audio Technology • Intel ® RST (Rapid Storage Technology) • Intel ® RRT (Rapid Recover Technology) • SATA (Serial ATA) 6Gb/s and 3Gb/s. • USB revision 2.0 • PCI Express revision 2.0 • ACPI 3.0b compliant • Dual Display support (Dual Graphic Pipes) • Blue-ray HD video playback
Security	• Intel® Integrated TPM 1.2 support
Management	• Intel® Active Management Technology (Intel® AMT) 7.0
Audio	Audio, 7.1 Channel High Definition Audio Codec using the VIA 1708B codec • Line-out • Line-in • Surround output: SIDE, LFE, CEN, BACK and FRONT • Microphone: MIC1 and MIC2 • CDROM in • SPDIF (electrical Interface only) • On-board speaker (Electromagnetic Sound Generator like Hycom HY-05LF)

Video	Intel ® i3, i5 or i7 processor supports Intel ® HD Graphics 3000. Intel ® Celeron ® Processor B810 supports Intel ® HD Graphics. eDP (Embedded DisplayPort) directly from processor. Analogue VGA and digital display ports (DVI, 2x DP, LVDS) via the Mobile Intel ® QM67 Chipset. • VGA (analogue panel) via DVI-I (sharing DVI-I connector with DVI-D) • DVI-D (sharing DVI-I connector with analogue VGA) • DP (DisplayPorts) dual, comply with DisplayPort 1.1a specification. • LVDS panel support up to 24 bit, 2 pixels/clock and 1920x1200. • HDMI panel support via DP to HDMI Adapter Converter. • Second VGA panel support via DP to VGA Adapter Converter • Second DVI panel support via DP to DVI Adapter Converter • Dual independent pipes for Mirror and Dual independent display support (exception is combination LVDS and eDP)
I/O Control	Via ITE IT8516E Embedded Controller and Winbond W83627DHG I/O Controller (both via LPC Bus interface)
Peripheral interfaces	• Six USB 2.0 ports on I/O area • Eight USB 2.0 ports on internal pinrows • Two IEEE 1394a-2000 (up to 400M bits/s) on internal pinrows • Four Serial ports (RS232) on internal pinrows • LPT via single in line connector (only KTQM67/Flex and KTQM67/ATXP) • Two Serial ATA-600 IDE interfaces • Four Serial ATA-300 IDE interfaces • RAID 0/1/5/10 support • mSATA via mPCIe_0 connector • PS/2 keyboard and mouse ports via pinrow
LAN Support	• 1x 10/100/1000Mbits/s LAN (ETHER1) using Intel® Lewisville 82579LM Gigabit PHY connected to QM67 supporting AMT 7.0 • 2x 10/100/1000Mbits/s LAN (ETHER2/ETHER3)using Intel® Hartwell 82574L PCI Express controllers • PXE Netboot supported. • Wake On LAN (WOL) supported
Expansion Capabilities	• PCI Bus routed to PCI slot(s) (PCI Local Bus Specification Revision 3.0, 33MHz) o KTQM67/mITX None. o KTQM67/Flex: 3 o KTQM67/ATXP: 6 • PCI-Express slot(s) (PCIe 2.0), for all KTQM67 family members: o 1 slot PCIe x16 o 1 slot PCIe x1 o 1 slot miniPCI-Express (PCI Express or mSATA signals, no USB signals) o 1 slot miniPCI-Express (PCI Express signals, no mSATA or USB signals) • SMBus, compatible with ACCES BUS and I2C BUS, (via Feature connector) • SPI bus routed to SPI connector • DDC Bus routed to DVI-I connector • 18 x GPIOs (General Purpose I/Os), (via Feature connector) • DAC, ADC, PWM and TIMER (Multiplexed), (via Feature connector) • WAKE UP / Interrupt Inputs (Multiplexed), (via Feature connector) • 3 Wire Bus for GPIO Expansion (up to 152 GPIOs), (via Feature connector) • 8 bit Timer output, (via Feature connector)

Hardware Monitor Subsystem	• Smart Fan control system, support Thermal® and Speed® cruise for three on-board Fan control connectors: FAN_CPU, FAN_SYS and FEATURE (AUXFAN in BIOS) • Three thermal inputs: CPU die temperature, System temperature and External temperature input routed to FEATURE connector. (Precision +/- 3ºC) • Voltage monitoring • Intrusion (Case Open) detect input, (via Feature connector) • Sleep S5# Indication, (via Feature connector) • System Powergood Signal, (via Feature connector)
Power Supply Unit	ATX/BTX (w. ATX+12V) PSU for full PCI/PCIe load. Alternatively (mITX version only): +12V single supply via ATX+12V (4-pole) connector, but with limitation to power load (especially +5V for USB).
Battery	Exchangeable 3.0V Lithium battery for on-board Real Time Clock and CMOS RAM. Manufacturer Panasonic / Part-number CR-2032L/BN, CR2032N/BN or CR-2032L/BE. Approximate 6.2 years retention. Current draw is 4.1µA when PSU is disconnected and 0 µA in S0 – S5. **CAUTION: Danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.**

BIOS	• Kontron Technology / AMI BIOS (EFI core version)
	• Support for ACPI 3.0 (Advanced Configuration and Power Interface), Plug & Play
	  o Suspend (S1 mode)
	  o Suspend To Ram (S3 mode)
	  o Suspend To Disk (S4 mode)
	• "Always On" BIOS power setting
	• RAID Support (RAID modes 0,1, 5 and 10)

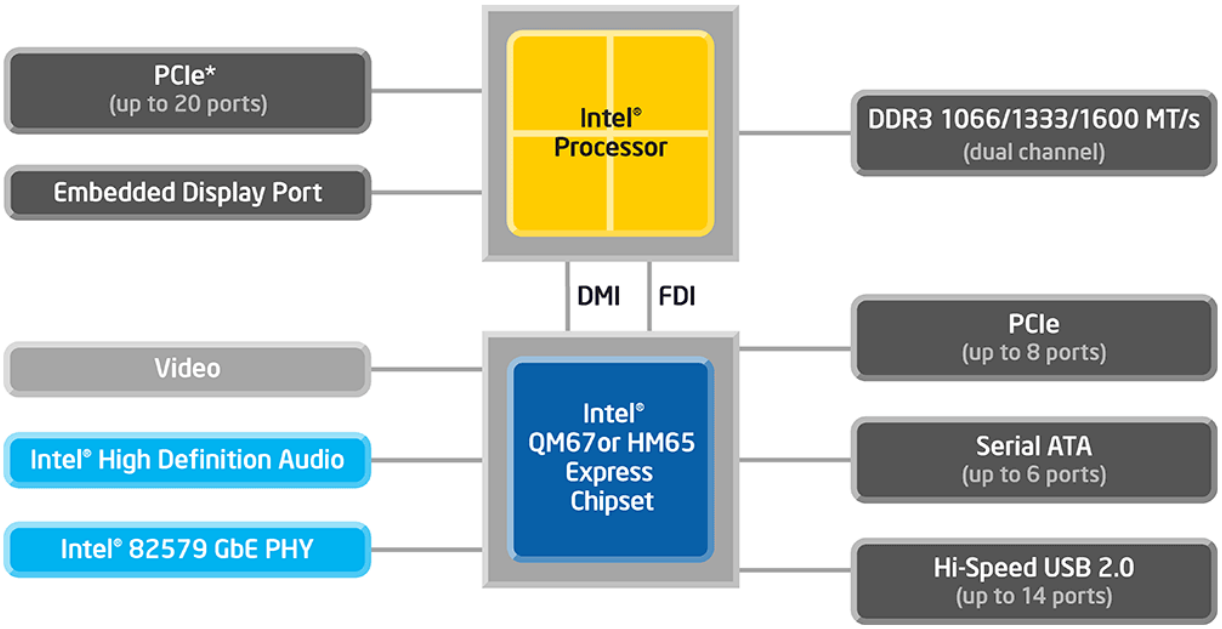
Operating Systems Support	• WinXP (32b + 64b *) • Vista (32b * + 64b *) • Windows 7 (32b + 64b *) • Linux • VxWorks • Windows Server 2003 r2 (32b * + 64b *) • Windows Server 2008 r2 (32b * + 64b *) • WES7 (32b + 64b) *= Out Of The Box installation test only.

Environmental Conditions	**Operating**: 0°C – 60°C operating temperature (forced cooling). It is the customer's responsibility to provide sufficient airflow around each of the components to keep them within allowed temperature range. 10% - 90% relative humidity (non-condensing) **Storage**: -20°C – 70°C; lower limit of storage temperature is defined by specification restriction of on-board CR2032 battery. Board with battery has been verified for storage temperature down to -40°C by Kontron. 5% - 95% relative humidity (non-condensing) **Electro Static Discharge (ESD) / Radiated Emissions (EMI):** All Peripheral interfaces intended for connection to external equipment are ESD/ EMI protected. EN 61000-4-2:2000 ESD Immunity EN55022:1998 class B Generic Emission Standard. **Safety:** IEC 60950-1: 2005, 2nd Edition UL 60950-1 CSA C22.2 No. 60950-1 Product Category: Information Technology Equipment Including Electrical Business Equipment Product Category CCN: NWGQ2, NWGQ8 File number: E194252 **Theoretical MTBF:** 268.956 / 131.729 hours @ 40ºC / 60ºC for the KTQM67/mITX TBD / TBD hours @ 40ºC / 60ºC for the KTQM67/Flex TBD / TBD hours @ 40ºC / 60ºC for the KTQM67/ATXP **Restriction of Hazardous Substances (RoHS):** All boards in the KTQM67 family are RoHS compliant. **Capacitor utilization:** No Tantalum capacitors on board Only Japanese brand Solid capacitors rated for 100 ºC used on board

2.2 System overview

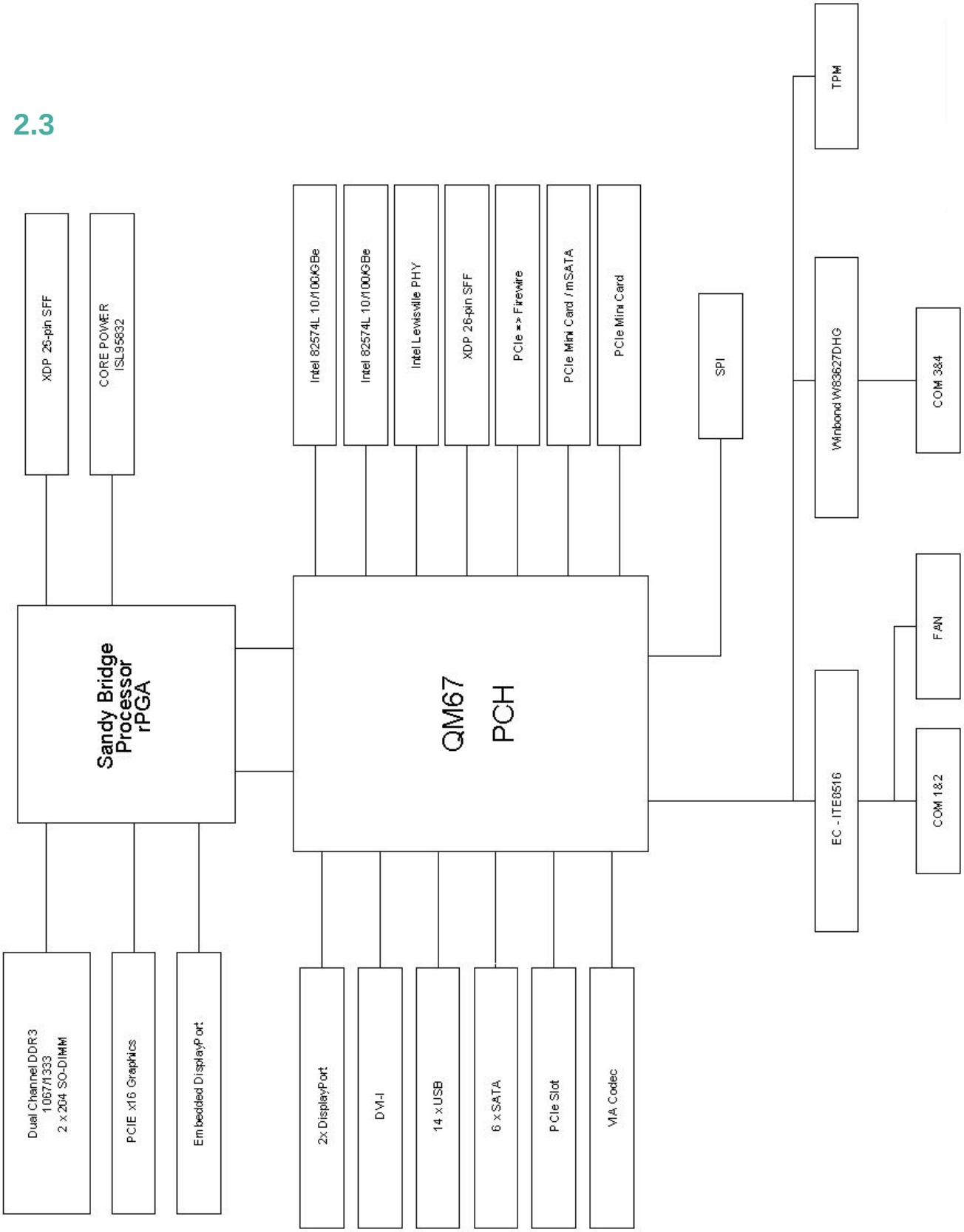
The block diagram below shows the architecture and main components of the KTQM67. The key component on the board is the Intel® QM67 (Cougar Point) Mobile Express Chipset.

Some components (PCI slots) are optional depending on board type.



More detailed block diagram on next page.

2.3


TPM
XDP 26-pin SFF
CORE POWER ISL95832
Intel 82574L 10/100/GBe
Intel 82574L 10/100/GBe
Intel Lewisville PHY
XDP 26-pin SFF
PCIe => Firewire
PCIe Mini Card / mSATA
PCIe Mini Card
SPI
Winbond W83627DHG
COM 3&4
Sandy Bridge Processor rPGA
QM67 PCH
FAN
EC - ITE8516
COM 1&2
Dual Channel DDR3 1067/1333 2 x 204 SO-DIMM
PCIE x16 Graphics
Embedded DisplayPort
2x DisplayPort
DVI-I
14 x USB
6 x SATA
PCIe Slot
VIA Codec

Processor Support Table

KTQM67 is designed to support the following PGA 988 processors (up to 60W power consumption):

2nd generation Intel® Core™ i7 processor Extreme Edition

2nd & 3rd generation Intel® Core™ i7 processor

2nd & 3rd generation Intel® Core™ i5 processor

2nd & 3rd generation Intel® Core™ i3 processor

Intel® Celeron® processor

In the following list you will find all CPU's supported by the chipset in according to Intel but also other CPU's if successfully tested.

Embedded CPU's are indicated by green text, successfully tested CPU's are indicated by **highlighted** text, successfully tested embedded CPU's are indicated by **green and highlighted** text and failed CPU's are indicated by red text.

Some processors in the list are distributed from Kontron, those CPU's are marked by an * (asterisk). However please notice that this marking is only guide line and maybe not fully updated.

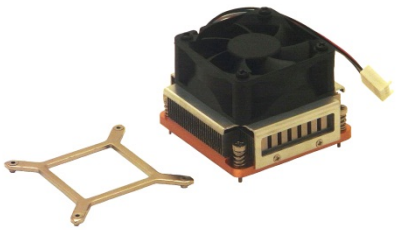
Processor Brand	Clock Speed [GHz]	Turbo Speed [GHz]	Cores	Threads	Bus Speed [MHz]	Cache [MB]	CPU Number	sSpec number	Stepping	Thermal Design Power [ºC/W]	Qty of SODIMM slots
Core™ i7 3rd gen.	2.9	3.6	2	4	1333/1600	4	3520M	SR0MU	L1	105/35	4
	2.7	3.7	4	8	1333/1600	8	3820QM	SR0MK	E1	105/45	4
	2.6	3.6	4	8	1333/1600	6	3720QM	SR0ML	E1	105/45	4
	2.3	3.3	4	8	1333/1600	6	3610QM	SR0MN	E1	105/45	4
	2.3	3.3	4	8	1333/1600	6	3610QE	SR0NP	E1	105/45	4
	2.1	3.1	4	8	1333/1600	6	3612QM	SR0MQ	E1	105/35	4
Core™ i7 2nd gen.	2.7	3.4	2	4	1066/1333	4	2620M	SR03F	J1	100/35	2
	2.5	3.5	4	8	1066/1333/1600	8	2920XM	SR02E	D2	100/55	4
	2.3	3.4	4	8	1066/1333/1600	8	2820QM	SR012	D2	100/45	4
	2.2	**3.4**	**4**	**8**	**1066/1333/1600**	**6**	**2720QM**	**SR014**	**D2**	100/**45**	**4**
	2.1	**3.0**	**4**	**8**	**1066/1333/1600**	**6**	**2710QE**	**SR02T**	**D2**	**100/45**	**4**
	2.0	2.9	4	8	1066/1333	6	2630QM	SR02Y	D2	100/45	2
Core™ i5 3rd gen.	2.8	3.5	2	4	1333/1600	3	3360M	SR0MV	L1	105/35	4
	2.7	3.3	2	4	1333/1600	3	3610ME	SR0QJ	L1	105/35	4
	2.6	3.3	2	4	1333/1600	3	3320M	SR0MX	L1	105/35	4
	2.5	3.1	2	4	1333/1600	3	3210M	SR0MZ	L1	105/35	4
Core™ i5 2nd gen.	**2.6**	**3.3**	**2**	**4**	**1066/1333**	**3**	**2540M**	**SR044**	**J1**	100/**35**	**2**
	2.5	**3.2**	**2**	**4**	**1066/1333**	**3**	**2520M**	**SR048**	**J1**	100/**35**	**2**
	2.5	3.1	2	4	1066/1333	3	2510E	SR02U	D2	100/35	2
	2.3	2.9	2	4	1066/1333	3	2410M	SR04B	J1	100/35	2
Core™ i3 3rd gen.	2.4	-	2	4	1333/1600	3	3110M	SR0N2	L1	105/35	4
Core™ i3 2nd gen.	2.2	-	2	4	1066/1333	3	2330E	SR02V	D2	100/35	2
	2.1	-	2	4	1066/1333	3	2310M	SR04R	J1	100/35	2
Celeron®	1.60	-	2	2	1066/1333	2	B810	SR088	Q0	100/35	2

Notes:

Using Ivy Bridge CPU increase Graphical performance (Intel ® HD Graphics 4000), and maybe also increase CPU performance. PCIe x1, PCIe x2, PCIe x4, PCIe x8 and PCIe x16 are supported on the PCIe x16 slot, however PCIe x2 is only supported when using 3rd generation Intel® Core™ processor (Ivy Bridge). Using Ivy Bridge CPU do not implement support for 3 simultaneous displays, do not implement support for USB 3.0 and do not implement support for PCIe 3.0. If any of these features are required, then maybe KTQM77/mITX might be a solution.

When using Ivy Bridge CPU, make sure BIOS version is the version 10 or above.

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



The Kontron PN 1044-9447 is “Active Cooler for KTQM67” capable of being used for processors (fully loaded) having Thermal Guideline up to 45W @ 60ºC ambient temperature.

All the processors in the list above, inclusive the Celeron processor, are supporting the Enhanced Intel® SpeedStep® which is improved SpeedStep technology for faster transition between voltage (power saving states) and frequency states with the result of improved power/performance balance.

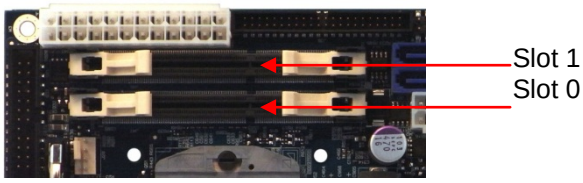
Intel® Turbo Boost Technology 2.0 is supported by i5 and i7, as indicated in above list of processors, and is enabling overclocking of all cores, when operated within the limits of thermal design power, temperature and current.

Intel® vPro Technology is supported by some i5 and i7 (not by Core i3 and Celeron).

A few types of 2nd Generation Core 2 processors and the Celeron processor only support two SODIMM and not all four SODIMM sockets available on the KTQM67/Flex and - /ATXP. In the table above the “Qty. of SODIMM slots” indicates if actual processor supports 2 or 4 SODIMM slots.

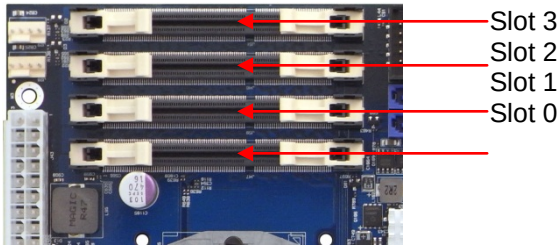
KTQM67/mITX has two DDR3 SODIMM slots and any of the two slots can be used.

Intel ® AMT works as long as RAM is installed in any of the slots.



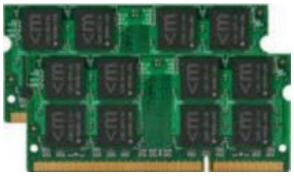
KTQM67/Flex and KTQM67/ATXP versions have four DDR3 SODIMM slots. Only some processors support all four slots, if not one of these CPU’s then only Slot 0 and Slot 2 can be used.

Intel ® AMT works as long as RAM is installed in either Slot 0 and/or Slot 2



2.4 System Memory support

The KTQM67/mITX has two DDR3 SODIMM sockets and the KTQM67/FLEX and /ATXP have four DDR3 SODIMM sockets. The sockets support the following memory features:



- 1.5V (only) 204-pin DDR3 SODIMM with gold-plated contacts
- Single/dual rank unbuffered DDR3 1066/1333/1600MT/s (PC3-8500/PC3-10600/PC3-12800)
  (DDR3 1600 only supported by some i7 processors)
- From 256MB and up to 4x 8GB. (up to 2x4GB tested)
  Notes:
  Only some of the processors support 4 SODIMM slots
  (see processor Support Table for more information).
  Less than 4GB displayed in System Properties using 32bit OS
  (Shared Video Memory/PCI resources is subtracted)
- SPD timings supported
- ECC not supported (PGA processors do not support ECC)

The installed DDR3 SODIMM should support the Serial Presence Detect (SPD) data structure. This allows the BIOS to read and configure the memory controller for optimal performance. If non-SPD memory is used, the BIOS will attempt to configure the memory settings, but performance and reliability may be impacted.

Memory Operating Frequencies
Regardless of the SODIMM type used, the memory frequency will either be equal to or less than the processor system bus frequency. For example, if DDR3 1600 memory is used with a 1333 MHz system bus frequency processor, the memory clock will operate at 666 MHz. The table below lists the resulting operating memory frequencies based on the combination of SODIMMs and processors.

DIMM Type	Module name	Memory Data transfers [Mill/s]	Processor system bus frequency [MHz]	Resulting memory clock frequency [MHz]	Peak transfer rate [MB/s]
DDR3 1066	PC3-8500	1066	1066 or more	533	8533
DDR3 1333	PC3-10600	1333	1333 or more	666	10666
DDR3 1600	PC3-12800	1600	1333 max	666	10666
DDR3 1600	PC3-12800	1600	1600	800	12800

Notes: Kontron offers the following memory modules:

- P/N 1044-7740, DDR3-SODIMM, **1GB**, 204p, 1333MHZ, PC3-10600
- P/N 1044-7743, DDR3-SODIMM, **2GB**, 204p, 1066MHZ, PC3-8500
- P/N TBD, DDR3-SODIMM, **2GB**, 204p, 1333MHZ, PC3-10600
- P/N 1044-7744, DDR3-SODIMM, **4GB**, 204p, 1066MHZ, PC3-8500
- P/N TBD, DDR3-SODIMM, **4GB**, 204p, 1333MHZ, PC3-10600
- P/N 1044-7745, DDR3-SODIMM, **8GB**, 204p, 1333MHZ, PC3-10600
- P/N TBD, DDR3-SODIMM, **4GB**, 204P, 1600MHZ, PC3-12800

2.5 KTQM67 Graphics Subsystem

The KTQM67 equipped with Intel ® i3, i5 or i7 processor, supports Intel ® HD Graphics 3000.
The KTQM67 equipped Intel ® Celeron ® Processor B810, supports Intel ® HD Graphics.

All KTQM67 versions support eDP (Embedded DisplayPort) directly from processor, and analogue VGA and digital display ports (DVI, 2x DP, LVDS) via the Mobile Intel ® QM67 Chipset. The Analogue VGA and DVI-D are sharing the DVI-I connector.

The DP interface supports the DisplayPort 1.1a specification. The PCH supports High-bandwidth Digital Content Protection for high definition content playback over digital interfaces. The PCH also integrates audio codecs for audio support over DP interfaces.

Up to two displays (any two display outputs except combination LVDS and eDP) can be activated at the same time and be used to implement dual independent display support or mirror display support. PCIe and PCI (Flex/ATXP only) graphics cards can be used to replace on-board graphics or in combination with on-board graphics.

2.5.1 Intel® HD Graphics 3000

Features of the Intel HD Graphics 3000 build into the i3, i5 and i7 processors, includes:

- High quality graphics engine supporting
  - DirectX10.1 and OpenGL 3.0 compliant
  - Shader Model 4.1 support
  - Intel ® Clear Video HD Technology
  - Intel ® Quick Sync Video Technology
  - Intel ® Flexible Display Interface (Intel ® FDI)
  - Core frequency of 350 - 1300 (Turbo) MHz
  - Memory Bandwidth up to 21.3 GB/s
  - 12 3D Execution Units
  - 1.62 GP/s and 2.7 GP/S pixel rate (eDP and DP outputs)
  - Hardware Acceleration full MPEG2, full VC-1 and full AVC
  - Dynamic Video Memory Technology (DVMT) support up to 1720 MB

- eDP (Embedded DisplayPort) (Not in combination with LVDS)

- LVDS panel Support, 18/24 bit colours in up to WUXGA (1920x1200 pixels) @60 Hz and SPWG (VESA) colour coding. OpenLDI (JEIDA) colour coding is 18 bit with or without Dithering. (Not in combination with eDP).

- DVI-I (Digital Visual Interface)
  - Either DVI-A or DVI-D can be used via DVI-I connector
  - DVI-A Analogue Display (CRT)
    - 300 MHz Integrated 24-bit RAMDAC
    - Up to QXGA (2048x1536 pixels) @ 75 Hz refresh
  - DVI-D Digital Display up to WUXGA (1920x1200 pixels) @60 Hz

- DP0 and DP1
  - 24/30 bit colours in WQXGA (2560x1600 pixels) and HDCP.

Use of DP Adapter Converters can implement HDMI support or second VGA or DVI panel support.

The HDMI interface supports the HDMI 1.4a specification including audio codec. However limitations to the resolution apply: 2048x1536 (VGA), 1920x1200 (HDMI and DVI)

1051-7619 Cable DP Extender cable 200mm (when using two DP converters)

DP to VGA PN 1045-5779 DP to HDMI PN 1045-5781 DP to DVI-D PN 1045-5780

2.6 Power Consumption

In order to ensure safe operation of the board, the ATX12V power supply must monitor the supply voltage and shut down if the supplies are out of range – refer to the hardware manual for the actual power supply specification. Please note, In order to keep the power consumption to a minimal level, boards do not implement a guaranteed minimum load. In some cases, this can lead to compatibility problems with ATX power supplies, which require a minimum load to stay in regulation.

The KTQM67 board is powered through the ATX/BTX connector and ATX+12V connector. Both connectors must be used in according to the ATX12V PSU standard. However the KTQM67/mITX also supports single +12V via ATX+12V-4pin Power Connector, but power limitations apply to +5V, where 14x USB, LVDS panel or eDP panel, COM ports, LPT port and Frontpanel connector shares 9.5A. ATX+12V-4pin power limitation is 145W, however more +12V power can be added via +12V and GND terminals in the 24-pin power connector.

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

The requirements to the supply voltages are as follows:

Supply	Min	Max	Note
VCC3.3	3.168V	3.432V	Should be ±4% for compliance with the ATX specification
Vcc	4.75V	5.25V	Should be ±5% for compliance with the ATX specification. Should be minimum 5.00V measured at USB connectors in order to meet the requirements of USB standard.
+12V	11.4V	12.6V	Should be ±5% for compliance with the ATX specification
–12V	–13.2V	–10.8V	Should be ±10% for compliance with the ATX specification
-5V	-5,50V	-4.5V	Not required for the KTQM67 boards
5VSB	4.75V	5.25V	Should be ±5% for compliance with the ATX specification

Total System power example

I7-2710QE @ 2.10GHz, 1x 4GB Ram, 1x 500gb HDD, 1x DVD-ROM, PSU

Operation	Power Supplied via	
	ATX + 12V	12V Only
Windows 7 32bit Idle	33W	36W
Windows 7 32bit 3Dmark 2003	70W-88W	72W-96W
Windows 7 32bit Intel Thermal Load	111W	111W

Note: Listed power consumptions are inclusive 15 - 25W for PSU, HDD and DVD.

More detailed Static Power Consumption

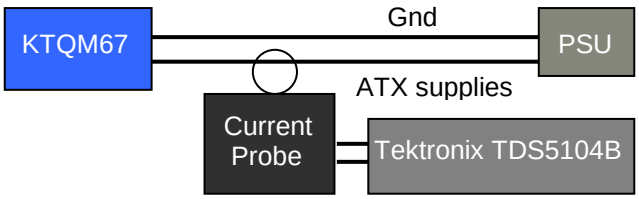
On the following pages the power consumption of different boards in different configurations are listed. For each configuration the power consumptions result are listed in 5 tables:

1- DOS, idle, mean
2- Windows7, Running 3DMARK 2005 & BiT 6, mean
3- S0, mean
4- S3, mean
5- S5, mean

Note: some S5 measurements have been carried out in two sub modes M3 and Moff. Only S5/M3 mode maintains power to the circuits used for AMT and waking up the system via LAN, Keyboard and USB, while both S5/M3 and S5/Moff maintain power to RTC, Power Button In circuit and CMOS data.

The principal test system and test equipment used

1. Tektronix TDS5104B
2. Tektronix TCPA300
3. Tektronix TCP312
4. Fluke 289
5. Fluke 179
6. ATX rail switch



Note: Power consumption of PSU (power loss), Monitor and HDD are not included.

The following six configurations (a – f) have been tested

a) Low Power Setup KTQM67/mITX ATX+12V PSU
b) Low Power Setup KTQM67/mITX +12V only PSU
Standard system configuration equipped with PCIex1 card, Internal graphics, 2x SATA disks, Intel i5 CPU, 1x SODIMM (1GB Modules), Monitor, Keyboard & Mouse. 1x 1-4GB USB Stick, 12V active cooler (KT), PSU (Corsair 430W)

c) High Power Setup KTQM67/mITX ATX+12V PSU
d) High Power Setup KTQM67/mITX +12V only PSU
Standard system configuration equipped with PCIex1, PCIex16, miniPCIe WLAN, 4x SATA disks, Intel i7 CPU, 2x SODIMM (1GB Modules), Monitor, Keyboard & Mouse, 4x 1-4GB USB Sticks, 12V active cooler (KT), PSU (Corsair 430W).

e) Low Power Setup KTQM67/Flex
Standard system configuration equipped with PCIex1 card (network PLNA001), Internal graphics, 2x SATA disks, Intel i5 CPU, 1x SODIMM (1GB Modules), Monitor, Keyboard & Mouse. 1x 1-4GB USB Stick, 12V active cooler (Intel Box), PSU (Fortron 400W)

f) High Power Setup KTQM67/Flex
Standard system configuration equipped with PCIex1 card (network PLNA001), PCIex16 (Graphics PLGA004), 4x SATA disks, Intel i7 CPU, 4x SODIMM (1GB Modules), Monitor, Keyboard & Mouse. 4x 1-4GB USB Stick, 12V active cooler (Intel Box), PSU (FPGA PS5)

a) Low Power Setup KTQM67/mITX ATX+12V PSU

DOS Idle, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V	0,140	1,680
+12V P4	1,222	14,664
+5V	0,411	2,055
+3V3	0,557	1,838
-12V	0,035	0,42
5VSB	0,007	0,035
Total		**20,7**

Windows 7, mean 3DMARK2005 (first scene) & BiT 6		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V	0,165	1,980
+12V P4	3,250	39,000
+5V	0,450	2,250
+3V3	0,577	1,904
-12V	0,046	0,552
5VSB	0,007	0,035
Total		**45,7**

S0 Mode, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V	0,107	1,284
+12V P4	0,510	6,120
+5V	0,336	1,680
+3V3	0,576	1,901
-12V	0,043	0,516
5VSB	0,007	0,035
Total		**11,5**

S3 Mode, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
5VSB	0,218	1,090
Total		**1,09**

S5 Mode, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
5VSB	0,213	1,065
Total		**1,07**

b) Low Power Setup KTQM67/mITX +12V only PSU

DOS Idle, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V P4	1,721	20,652
Total		**20,7**

Windows 7, mean 3DMARK2005 (first scene) & BiT 6		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V P4	3,940	47,28
Total		**47,3**

S0 Mode, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V P4	0,992	11,904
Total		**11,9**

S3 Mode, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V P4	0,099	1,188
Total		**1,19**

S5 Mode, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V P4	0,098	1,176
Total		**1,18**

c) High Power Setup KTQM67/mITX ATX+12V PSU

DOS Idle, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V	0,932	11,184
+12V P4	1,102	13,224
+5V	0,452	2,260
+3V3	0,553	1,825
-12V	0,036	0,432
5VSB	0,007	0,035
Total		**29,0**

Windows 7, mean 3DMARK2005 (first scene) & BiT 6		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V	1,355	16,260
+12V P4	4,663	55,956
+5V	0,474	2,370
+3V3	0,968	3,194
-12V	0,049	0,588
5VSB	0,007	0,035
Total		**78,4**

S0 Mode, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V	0,569	6,828
+12V P4	0,485	5,820
+5V	0,420	2,100
+3V3	0,964	3,812
-12V	0,049	0,588
5VSB	0,007	0,035
Total		**18,6**

S3 Mode, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
5VSB	0,226	1,130
Total		**1,13**

S5 Mode, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
5VSB	0,219	1,095
Total		**1,10**

d) High Power Setup KTQM67/mITX +12V only PSU

DOS Idle, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V P4	2,499	29,988
Total		**30,0**

Windows 7, mean 3DMARK2005 (first scene) & BiT 6		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V P4	6,712	80,544
Total		**80,5**

S0 Mode, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V P4	1,615	19,38
Total		**19,4**

S3 Mode, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V P4	0,104	1,248
Total		**1,24**

S5 Mode, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V P4	0,101	1,212
Total		**1,21**

e) Low Power Setup KTQM67/Flex

DOS Idle, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V	0.194	2.328
+12V P4	1.339	16.068
+5V	0.353	1.765
+3V3	0.662	2.185
-12V	0.020	0.240
5VSB	0.001	0.005
Total		**22.6**

Windows 7, mean 3DMARK2005 (first scene) & BiT 6		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V	0.162	1.944
+12V P4	4.173	50.076
+5V	0.460	2.300
+3V3	0.833	2.749
-12V	0.034	0.408
5VSB	0.002	0.010
Total		**57.5**

S0 Mode, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V	0.162	1.944
+12V P4	2.060	24.720
+5V	0.390	1.950
+3V3	0.832	2.746
-12V	0.035	0.420
5VSB	0.002	0.010
Total		**31.8**

S3 Mode, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
5VSB	0.174	0.870
Total		**0.87**

S5/M3 Mode (wake+ AMT), Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
5VSB	0.270	1.350
Total		**1.35**

S5/Moff Mode (no wake no AMT), Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
5VSB	0.175	0.875
Total		**0.88**

f) High Power Setup KTQM67/Flex

DOS Idle, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V	1.027	12.324
+12V P4	1.235	14.820
+5V	0.419	2.095
+3V3	0.666	2.198
-12V	0.028	0.336
5VSB	0.002	0.010
Total		**31.8**

Windows 7, mean 3DMARK2005 (first scene) & BiT 6		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V	1.260	15.120
+12V P4	5.445	65.340
+5V	0.454	2.270
+3V3	0.835	2.756
-12V	0.040	0.480
5VSB	0.002	0.010
Total		**86.0**

S0 Mode, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
+12V	0.626	7.512
+12V P4	1.969	23.628
+5V	0.401	2.005
+3V3	0.834	2.752
-12V	0.041	0.492
5VSB	0.002	0.010
Total		**36.4**

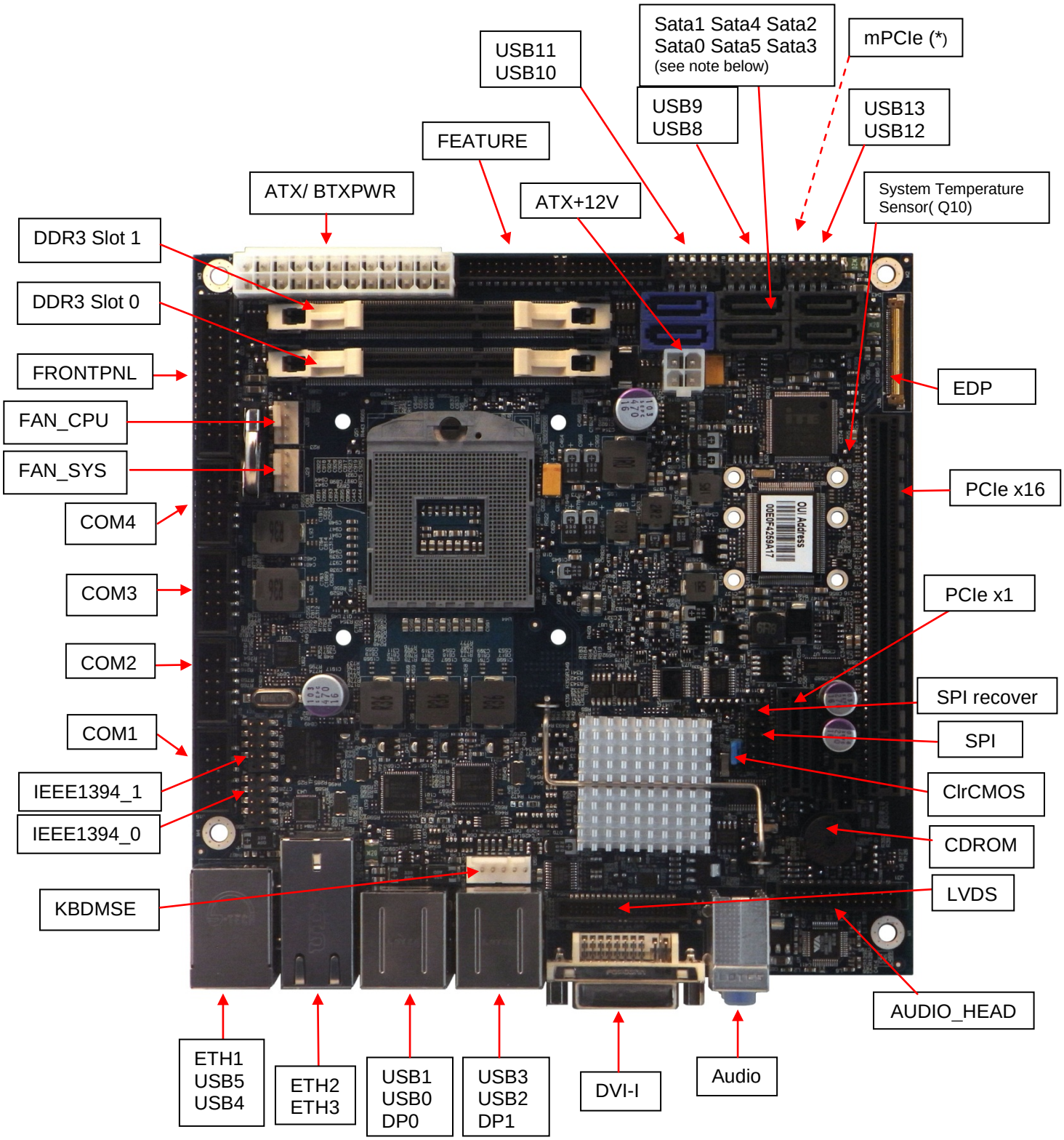
S3 Mode, Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
5VSB	0.026	0.130
Total		**0.13**

S5/M3 Mode (wake+ AMT), Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
5VSB	0.266	1.330
Total		**1.33**

S5/Moff Mode (no wake no AMT), Mean, No external load		
Supply	**Current draw [A]**	**Power consumption [W]**
5VSB	0.184	0.920
Total		**0.92**

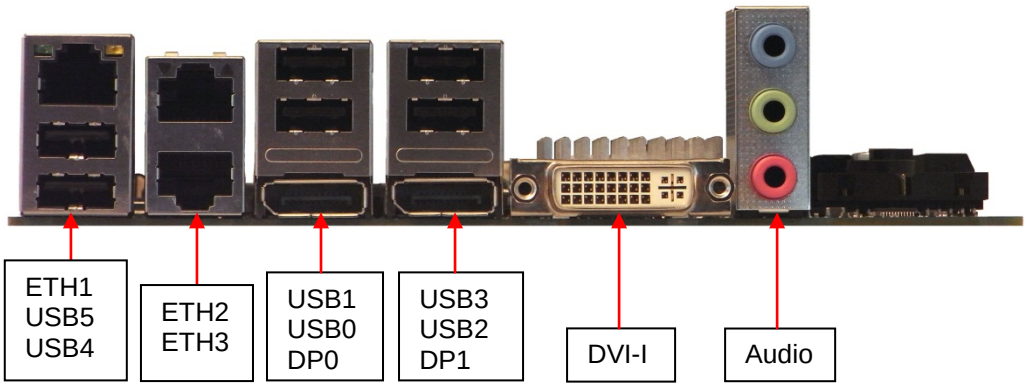
3 Connector Locations

3.1 KTQM67/mITX – frontside

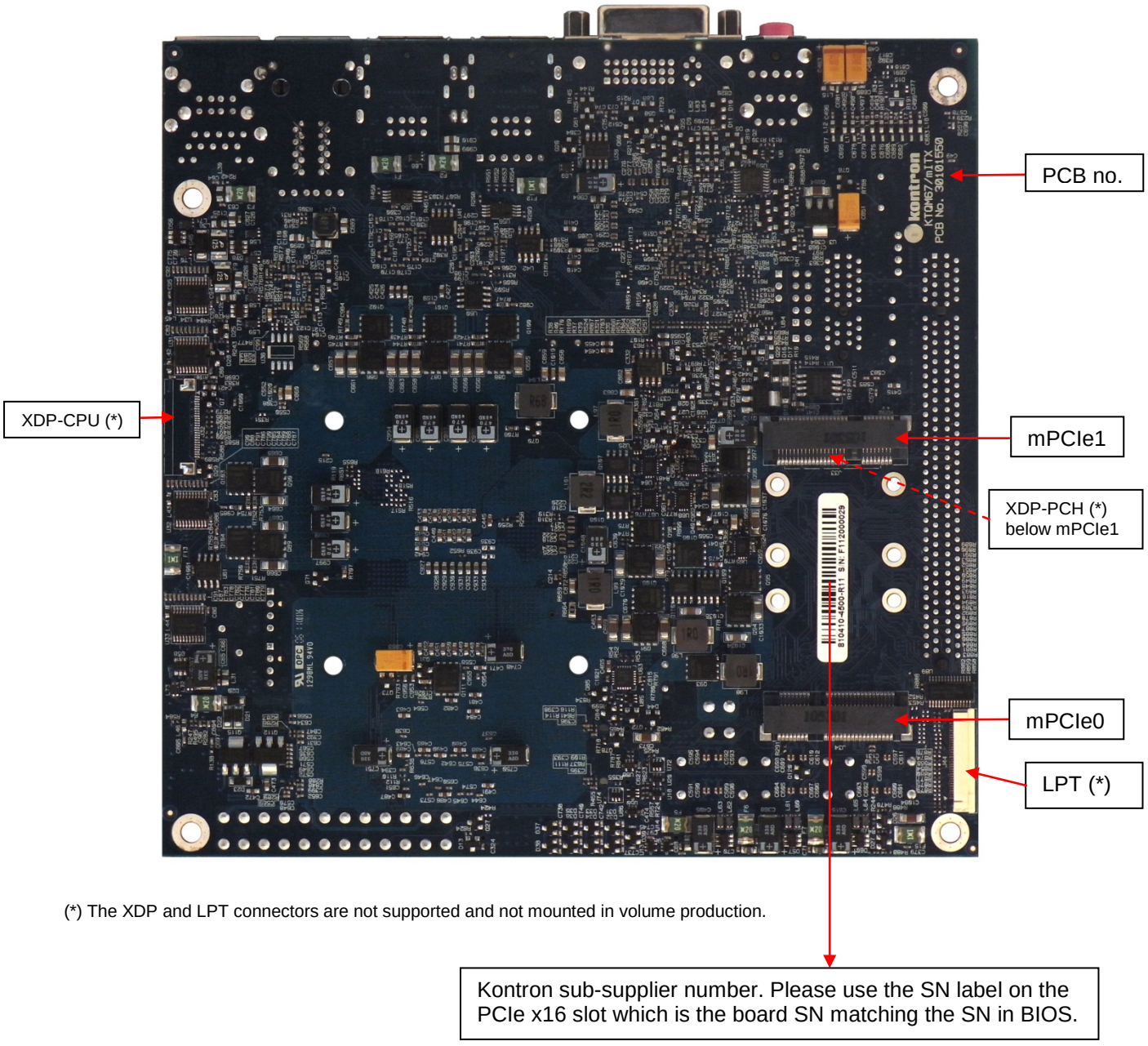


Note: Sata0/Sata1support up to 6GB/s and Sata2/Sata3/Sata4/Sata5 support up to 3GB/S.

3.2 KTQM67/mITX – IO Bracket area

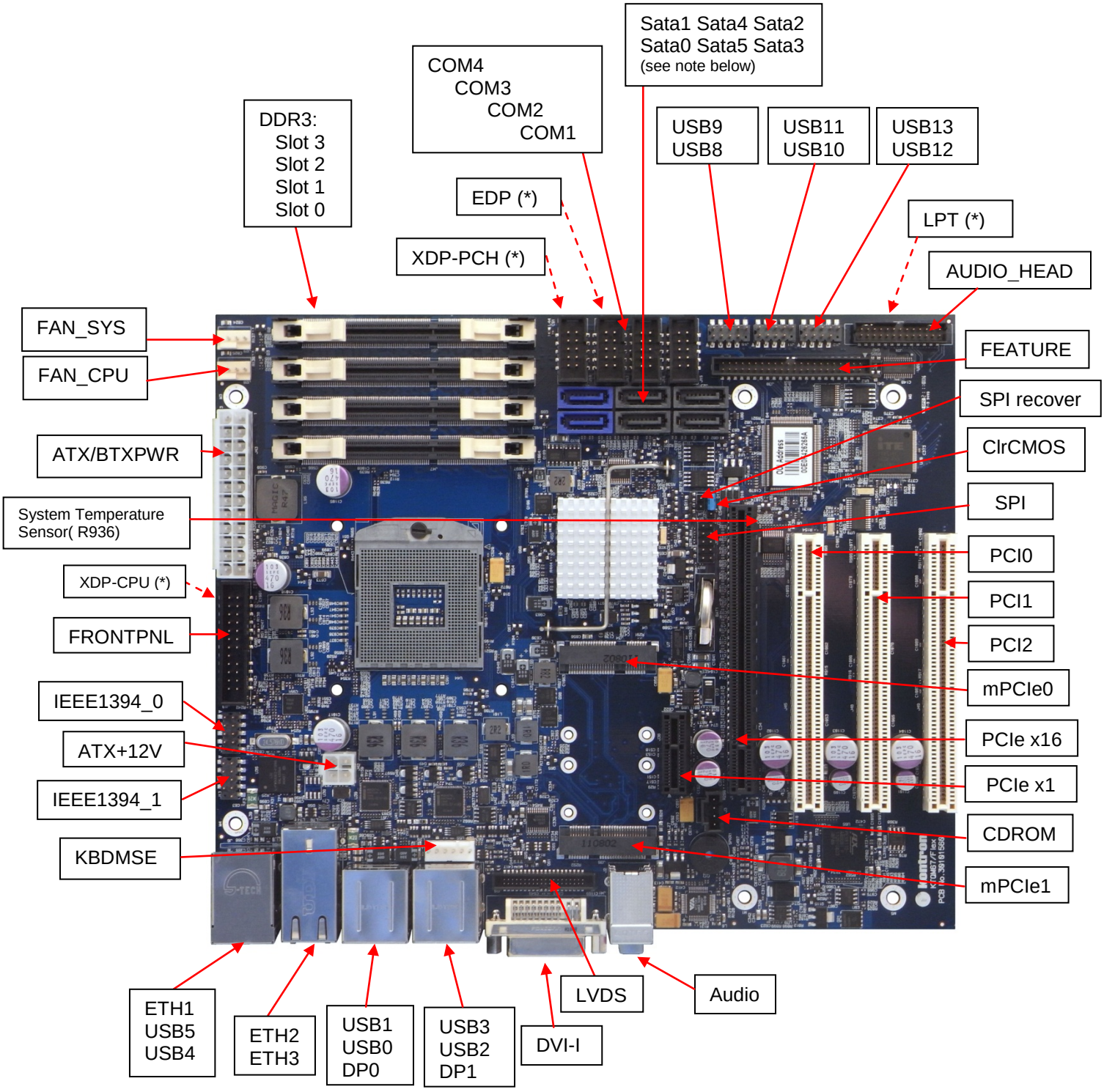


3.3 KTQM67/mITX - backside



(*) The XDP and LPT connectors are not supported and not mounted in volume production.

3.4 KTQM67/Flex

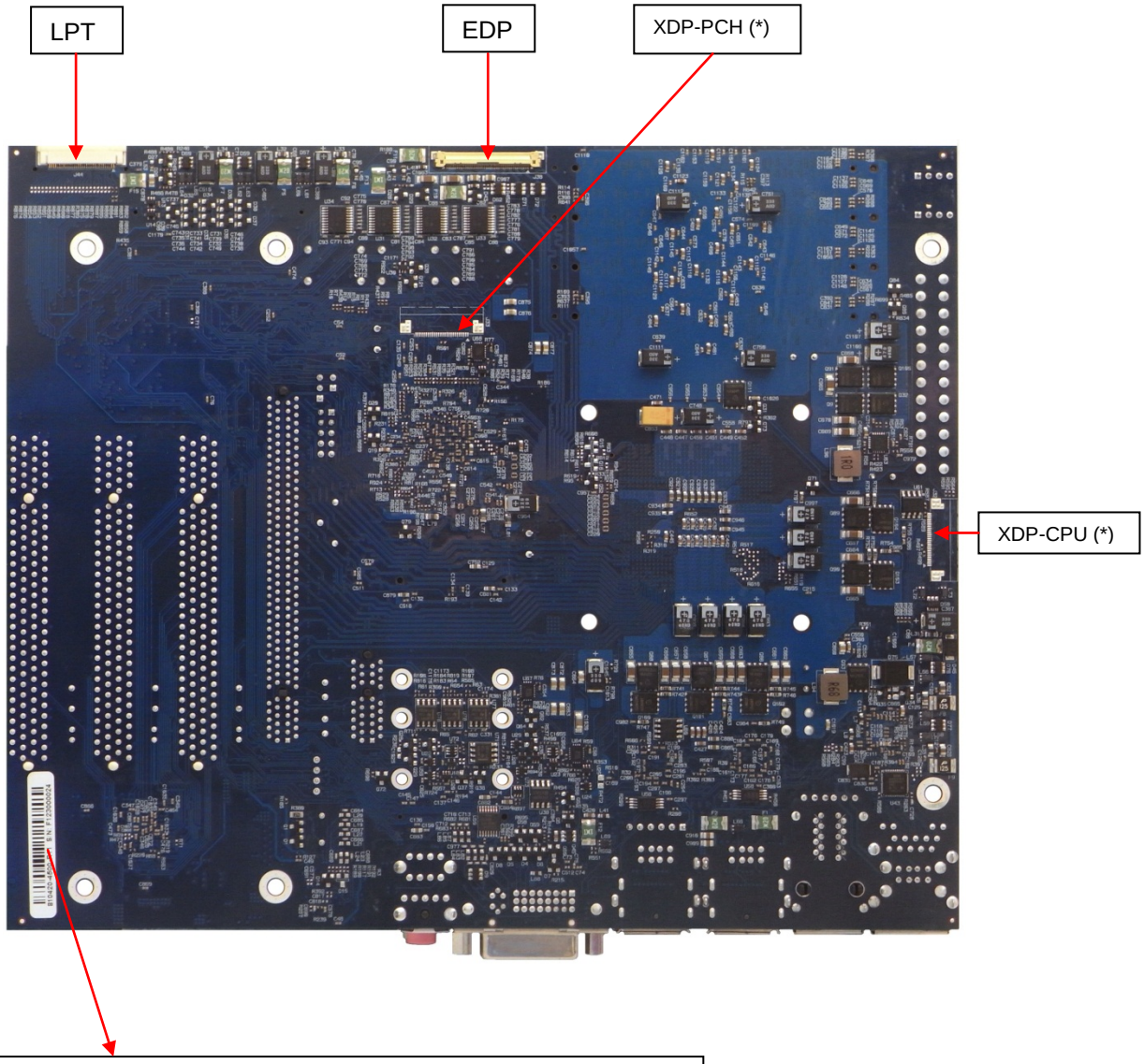


(For picture of IO Bracket area, see previous page)

(*) Connectors located on the backside. The XDP connectors are not supported and not mounted in volume production.

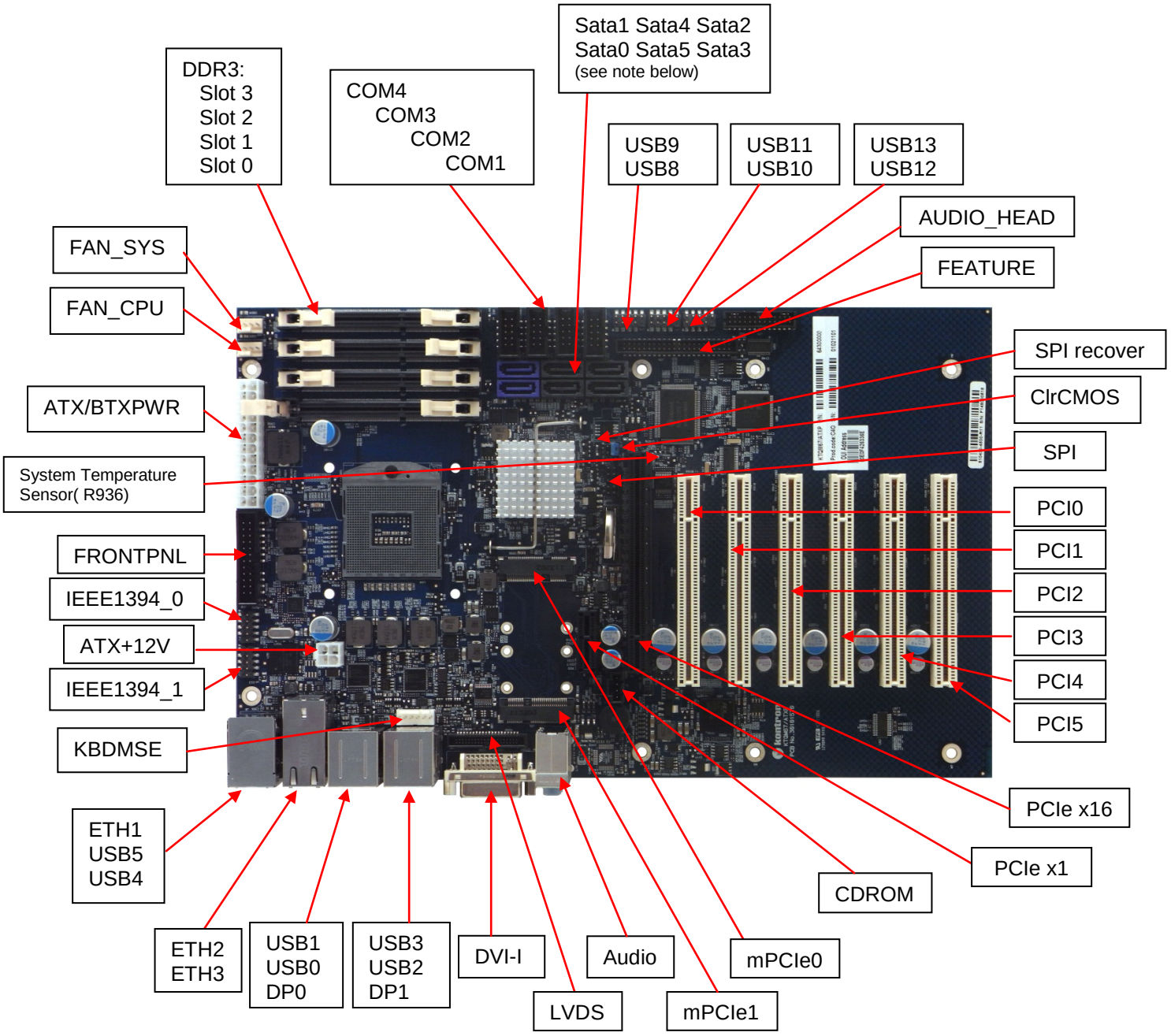
Note: Sata0/Sata1support up to 6GB/s and Sata2/Sata3/Sata4/Sata5 support up to 3GB/S.

3.5 KTQM67/Flex - backside



(*) The XDP connectors are not supported and not mounted in volume production.

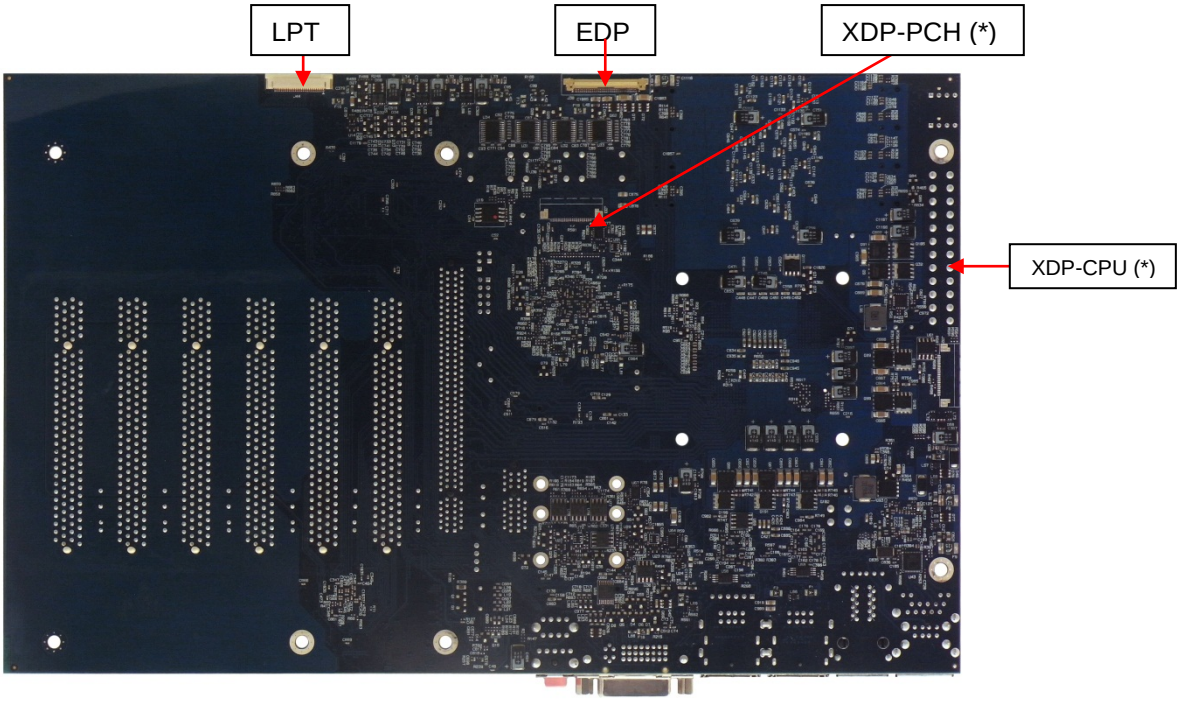
3.6 KTQM67/ATXP



(For picture of IO Bracket area, see" KTQM67/mITX – IO Bracket area")

Note: Sata0/Sata1support up to 6GB/s and Sata2/Sata3/Sata4/Sata5 support up to 3GB/S.

3.7 KTQM67/ATXP - backside



(*) The XDP connectors are not supported and not mounted in volume production.

4 Connector Definitions

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

The connector definitions follow the following notation:

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

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

5 IO-Area Connectors

5.1 Display connectors (IO Area)

The KTQM67 family provides one on-board DVI-I port (both digital and analogue), two on-board DP's (DisplayPort), one on-board eDP (Embedded DisplayPort) and one on-board LVDS panel interface. Two graphic pipes are supported; meaning that up to two independent displays can be implemented using any two of the above mentioned graphic ports.

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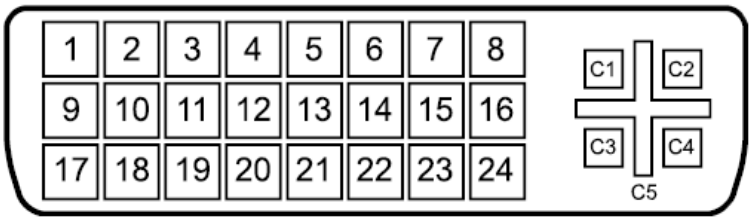
5.1.1 DVI Connector (DVI-I) (J41)

The **DVI-I** connector support DVI Digital output and DVI Analogue output.



Female socket, front view

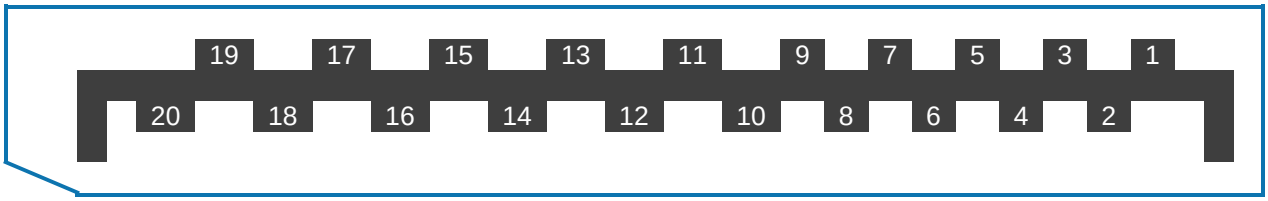
Signal Description - DVI Connector:

Pin	Signal	Description	Type	Pull U/D
1	TMDS Data 2-	Digital Red – (Link 1)	LVDS OUT	
2	TMDS Data 2+	Digital Red + (Link 1)	LVDS OUT	
3	TMDS Data 2/4 Shield		PWR	
4	NC		NC	
5	NC		NC	
6	DDC Clock	DDC Clock	IO	2K2
7	DDC Data	DDC Data	IO	2K2
8	NC		NC	
9	TMDS Data 1-	Digital Green – (Link 1)	LVDS OUT	
10	TMDS Data 1+	Digital Green + (Link 1)	LVDS OUT	
11	TMDS Data 1/3 Shield		PWR	
12	NC		NC	
13	NC		NC	
14	+5V	Power for monitor when in standby	PWR	
15	GND		PWR	
16	Hot Plug Detect	Hot Plug Detect	I	
17	TMDS Data 0-	Digital Blue – (Link 1) / Digital sync	LVDS OUT	
18	TMDS Data 0+	Digital Blue + (Link 1) / Digital sync	LVDS OUT	
19	TMDS Data 0/5 Shield		PWR	
20	NC		NC	
21	NC		NC	
22	TMDS Clock Shield		PWR	
23	TMDS Clock+	Digital clock + (Link 1)	LVDS OUT	
24	TMDS Clock-	Digital clock - (Link 1)	LVDS OUT	
C1	ANALOG RED	Analog output carrying the red color signal	O	/75R
C2	ANALOG GREEN	Analog output carrying the green color signal	O	/75R
C3	ANALOG BLUE	Analog output carrying the blue color signal	O	/75R
C4	ANALOG HSYNC	CRT horizontal synchronization output.	O	
C5	ANALOG GND	Ground reference for RED, GREEN, and BLUE	PWR	
C6	ANALOG GND	Ground reference for RED, GREEN, and BLUE	PWR	

Note: The +5V supply is fused by a 1.1A resettable fuse

5.1.2 DP Connectors (DP0/DP1) (J40/J39)

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



Pin	Signal	Description	Type	Note
1	Lane 0 (p)		LVDS	
2	GND		PWR	
3	Lane 0 (n)		LVDS	
4	Lane 1 (p)		LVDS	
5	GND		PWR	
6	Lane 1 (n)		LVDS	
7	Lane 2 (p)		LVDS	
8	GND		PWR	
9	Lane 2 (n)		LVDS	
10	Lane 3 (p)		LVDS	
11	GND		PWR	
12	Lane 3 (n)		LVDS	
13	Config1	Aux or DDC selection	I	Internally pull down (1Mohm). Aux channel on pin 15/17 selected as default (when NC) DDC channel on pin 15/17, If HDMI adapter used (3.3V)
14	Config2	(Not used)	O	Internally connected to GND
15	Aux Ch (p)	Aux Channel (+) or DDC Clk		AUX (+) channel used by DP DDC Clk used by HDMI
16	GND		PWR	
17	Aux Ch (n)	Aux Channel (-) or DDC Data		AUX (-) channel used by DP DDC Data used by HDMI
18	Hot Plug		I	Internally pull down (100Kohm).
19	Return		PWR	Same as GND
20	3.3V		PWR	Fused by 1.5A resetable PTC fuse, common for DP0 and DP1

5.2 Ethernet Connectors

The KTQM67 boards supports three channels of 10/100/1000Mb Ethernet, one (ETH1) is based on Intel® Lewisville 82579LM Gigabit PHY with AMT 7.0 support and the two other controllers (ETHER2 & ETHER3) are based on Intel® Hartwell 82574L PCI Express controller.

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

The signals for the Ethernet ports are as follows:

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

Note: MDI = Media Dependent Interface.

Ethernet connector 1 (ETH1) is mounted together with USB Ports 4 and 5.
Ethernet connector 2 (ETH2) is mounted together with and above Ethernet connector 3 (ETH3).

The pinout of the RJ45 connectors is as follows:

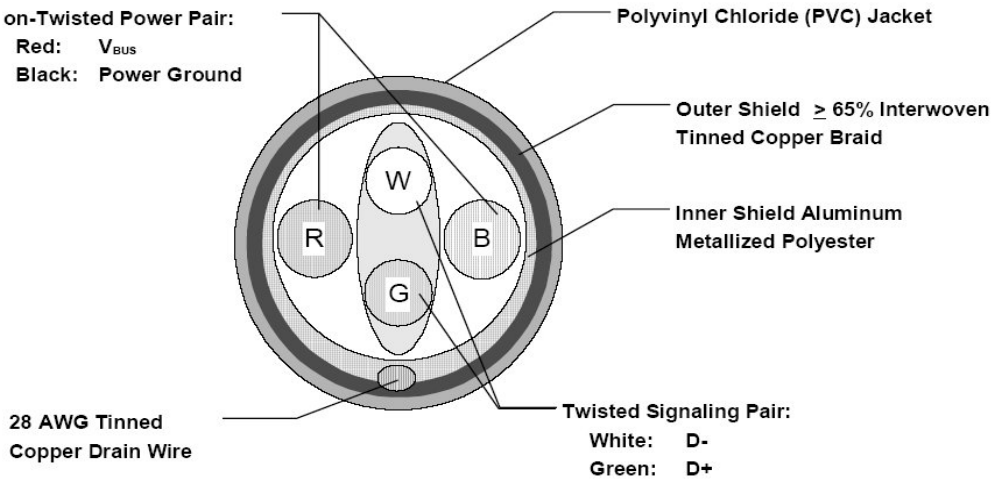
Signal	PIN	Type	Ioh/Iol	Note
MDI0+				
MDI0-				
MDI1+				
MDI2+				
MDI2-				
MDI1-				
MDI3+				
MDI3-				
	8 7 6 5 4 3 2 1			

5.3 USB Connectors (IO Area)

The KTQM67 board contains two EHCI (Enhanced Host Controller Interface) host controllers (EHCI1 and EHCI2) that support up to fourteen USB 2.0 ports allowing data transfers up to 480Mb/s. Legacy Keyboard/Mouse and wakeup from sleep states are supported. Over-current detection on all fourteen USB ports is supported. The following USB connectors are available in the IO Area.

USB Port 0 and 1 (via EHCI1) are supplied on the combined USB0, USB1 and DP0 connector.
USB Port 2 and 3 (via EHCI1) are supplied on the combined USB2, USB3 and DP1 connector.
USB Port 4 and 5 (via EHCI1) are supplied on the combined ETH1, USB4 and USB5 connector.

Note: It is required to use only HiSpeed USB cable, specified in USB2.0 standard:



5.3.1 USB Connector 0/1 (USB0/1)

USB Ports 0 and 1 are mounted together with DP0 port.

Note	Type	Signal	PIN	Signal	Type	Note
1	PWR	5V/SB5V	1 2 3 4	GND	PWR	
	IO	USB1-		USB1+	IO	
1	PWR	5V/SB5V	1 2 3 4	GND	PWR	
	IO	USB0-		USB0+	IO	

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

Signal	Description
USB0+ USB0- USB1+ USB1-	Differential pair works as Data/Address/Command Bus.
5V/SB5V	5V supply for external devices. SB5V is supplied during powerdown to allow wakeup on USB device activity. Protected by resettable 1A fuse covering both USB ports.

5.3.2 USB Connector 2/3 (USB2/3)

USB Ports 2 and 3 are mounted together with DP1 port.

Note	Type	Signal	PIN	Signal	Type	Note
1	PWR	5V/SB5V	1 2 3 4	GND	PWR	
	IO	USB3-		USB3+	IO	
1	PWR	5V/SB5V	1 2 3 4	GND	PWR	
	IO	USB2-		USB2+	IO	

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

Signal	Description
USB2+ USB2- USB3+ USB3-	Differential pair works as Data/Address/Command Bus.
5V/SB5V	5V supply for external devices. SB5V is supplied during powerdown to allow wakeup on USB device activity. Protected by resettable 1A fuse covering both USB ports.

5.3.3 USB Connector 4/5 (USB4/5)

USB Ports 4 and 5 are mounted together with ETH1 port.

Note	Type	Signal	PIN	Signal	Type	Note
1	PWR	5V/SB5V	1 2 3 4	GND	PWR	
	IO	USB5-		USB5+	IO	
1	PWR	5V/SB5V	1 2 3 4	GND	PWR	
	IO	USB4-		USB4+	IO	

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

Signal	Description
USB4+ USB4- USB5+ USB5-	Differential pair works as Data/Address/Command Bus.
5V/SB5V	5V supply for external devices. SB5V is supplied during powerdown to allow wakeup on USB device activity. Protected by resettable 1A fuse covering both USB ports.

5.4 Audio Connector (IO Area)

The on-board Audio circuit implements 7.1+2 Channel High Definition Audio with UAA (Universal Audio Architecture), featuring five 24-bit stereo DACs and three 20-bit stereo ADCs. The Following Audio connector is available in IO Area.

Audio Speakers, Line-in and Microphone are available in the stacked audiojack connector

	Signal	Type	Note
TIP	LINE1-L	IA	
RING	LINE1-R	IA	
SLEEVE	GND	PWR	
TIP	FRONT-OUT-L	OA	
RING	FRONT-OUT-R	OA	
SLEEVE	GND	PWR	
TIP	MIC1-L	IA	
RING	MIC1-R	IA	
SLEEVE	GND	PWR	

Signal	Description	Note
FRONT-OUT-L	Front Speakers (Speaker Out Left).	
FRONT-OUT-R	Front Speakers (Speaker Out Right).	
MIC1-L	Microphone 1 - Left	Shared with Audio Header
MIC1-R	Microphone 1 - Right	Shared with Audio Header
LINE1-L	Line 1 signal - Left	Shared with Audio Header
LINE1-R	Line 1 signal - Right	Shared with Audio Header

6 Internal Connectors

6.1 Power Connector (ATX/BTXPWR)

The KTQM67 boards are designed to be supplied from a standard ATX (or BTX) power supply. Alternatively supplied by single +12V +/-5% (mITX version only). Use of BTX supply is not required for operation, but may be required to drive high-power PCIe cards.

ATX/ BTX Power Connector (J43):

Note	Type	Signal	PIN		Signal	Type	Note
	PWR	3V3	12	24	GND	PWR	
	PWR	+12V	11	23	5V	PWR	
	PWR	+12V	10	22	5V	PWR	
	PWR	SB5V	9	21	5V	PWR	
	I	P_OK	8	20	-5V	PWR	1
	PWR	GND	7	19	GND	PWR	
	PWR	5V	6	18	GND	PWR	
	PWR	GND	5	17	GND	PWR	
	PWR	5V	4	16	PSON#	OC	
	PWR	GND	3	15	GND	PWR	
	PWR	3V3	2	14	-12V	PWR	
	PWR	3V3	1	13	3V3	PWR	

Note 1: -5V supply is not used on-board.

See chapter “Power Consumption” regarding input tolerances on 3.3V, 5V, SB5V, +12 and -12V (also refer to ATX specification version 2.2).

ATX+12V-4pin Power Connector (J42):

Note	Type	Signal	PIN		Signal	Type	Note
	PWR	GND	2	4	+12V	PWR	1
	PWR	GND	1	3	+12V	PWR	1

Note 1: Use of the 4-pin ATX+12V Power Connector is required for operation of all KTQM67 board versions.

Signal	Description
P_OK	P_OK is a power good signal and should be asserted high by the power supply to indicate that the +5VDC and +3.3VDC outputs are above the undervoltage thresholds of the power supply. When this signal is asserted high, there should be sufficient energy stored by the converter to guarantee continuous power operation within specification. Conversely, when the output voltages fall below the undervoltage threshold, or when mains power has been removed for a time sufficiently long so that power supply operation is no longer guaranteed, P_OK should be de-asserted to a low state. The recommended electrical and timing characteristics of the P_OK (PWR_OK) signal are provided in the *ATX12V Power SupplyDesign Guide*. It is strongly recommended to use an ATX or BTX supply, in order to implement the supervision of the 5V and 3V3 supplies. These supplies are not supervised on-board.
PS_ON#	Active low open drain signal from the board to the power supply to turn on the power supply outputs. Signal must be pulled high by the power supply.

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

6.2 Fan Connectors (FAN_CPU) (J28) and (FAN_SYS) (J29)

The **FAN_CPU** is used for the connection of the FAN for the CPU.
The **FAN_SYS** can be used to power, control and monitor a fan for chassis ventilation etc.

The 4pin header is recommended to be used for driving 4-wire type Fan in order to implement FAN speed control. 3-wire Fan is also possible, but no fan speed control is integrated.

4-pin Mode:

PIN	Signal	Type	Ioh/Iol	Pull U/D	Note
1	CONTROL	O	-	-	
2	SENSE	I	-	4K7	
3	+12V	PWR	-	-	
4	GND	PWR	-	-	

Signal	Description
CONTROL	PWM signal for FAN speed control
SENSE	Tacho signal from the fan for supervision. The signals shall be generated by an open collector transistor or similar. On-board is a pull-up resistor 4K7 to +12V. The signal has to be pulsed, typically twice per rotation.
12V	+12V supply for fan. A maximum of 2000mA can be supplied from this pin.
GND	Power Supply GND signal

3-pin Mode:

PIN	Signal	Type	Ioh/Iol	Pull U/D	Note
-					
2	SENSE	I	-	4K7	
3	+12V	PWR	-	-	
4	GND	PWR	-	-	

Signal	Description
SENSE	Tacho signal from the fan for supervision. The signals shall be generated by an open collector transistor or similar. On-board is a pull-up resistor 4K7 to +12V. The signal has to be pulsed, typically twice per rotation.
12V	+12V supply for fan. A maximum of 2000mA can be supplied from this pin.
GND	Power Supply GND signal

6.3 PS/2 Keyboard and Mouse connector (KBDMSE) (J27)

Attachment of a PS/2 keyboard/mouse can be done through the pinrow connector KBDMSE (J27). Both interfaces utilize open-drain signalling with on-board pull-up.

The PS/2 mouse and keyboard is supplied from SB5V when in standby mode in order to enable keyboard or mouse activity to bring the system out from power saving states. The supply is provided through a 1.1A resettable fuse.

PIN	Signal	Type	Ioh/Iol	Pull U/D	Note
1	KBDCLK	IOD	/14mA	2K7	
2	KBDDAT	IOD	/14mA	2K7	
3	MSCLK	IOD	/14mA	2K7	
4	MSDAT	IOD	/14mA	2K7	
5	5V/SB5V	PWR	-	-	
6	GND	PWR	-	-	

Signal Description – Keyboard & and mouse Connector (KBDMSE).

Signal	Description
MSCLK	Bi-directional clock signal used to strobe data/commands from/to the PS/2 mouse.
MSDAT	Bi-directional serial data line used to transfer data from or commands to the PS/2 mouse.
KDBCLK	Bi-directional clock signal used to strobe data/commands from/to the PC-AT keyboard.
KBDDAT	Bi-directional serial data line used to transfer data from or commands to the PC-AT keyboard.

6.4 Display connectors (Internal)

The KTQM67 family provides internal display connectors: one on-board eDP (Embedded DisplayPort) and one on-board LVDS panel interface.

For IO Area Display Connectors (DVI-I and two DP's), see earlier section.

Two graphic pipes are supported; meaning that up to two independent displays can be implemented using any two of display connectors (IO Area - and Internal connectors) with the exception of the combination eDP + LVDS.
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6.4.1 eDP connector (EDP) (J38)

The eDP connector is based on single in-line 40 pole connector type TYCO 5-2069716-3.

Pin	Signal	Description	Type	Note
1	NC		NC	
2	BL-VCC	Backlight Voltage	PWR	Fused by 1.5A resetable PTC fuse 12V (in S0 mode)
3	BL-VCC		PWR	
4	BL-VCC		PWR	
5	BL-VCC		PWR	
6	NC		NC	
7	NC		NC	
8	BL-PWM	Back Light PWM (Pulse Width Modulated)	O	To adjust Back Light intensity
9	BL-EN	Back Light Enable	O	To enable the Back Light
10	BL-GND	Backlight GND	PWR	
11	BL-GND		PWR	
12	BL-GND		PWR	
13	BL-GND		PWR	
14	HPD	Hot Plug Detection	I	
15	LCD-GND	Display panel GND	PWR	
16	LCD-GND		PWR	
17	LCD-GND		PWR	
18	LCD-GND		PWR	
19	NC		NC	
20	LCD-VCC	Display panel voltage	PWR	Shared with LVDS connector 3.3V or 5V selected in BIOS Fused by 1.5A resetable PTC fuse
21	LCD-VCC		PWR	
22	LCD-VCC		PWR	
23	LCD-VCC		PWR	
24	GND		PWR	
25	Aux (n)		LVDS	
26	Aux (p)		LVDS	
27	GND		PWR	
28	Lane 0 (p)		LVDS	
29	Lane 0 (n)		LVDS	
30	GND		PWR	
31	Lane 1 (p)		LVDS	
32	Lane 1 (n)		LVDS	
33	GND		PWR	
34	Lane 2 (p)		LVDS	
35	Lane 2 (n)		LVDS	
36	GND		PWR	
37	Lane 3 (p)		LVDS	
38	Lane 3 (n)		LVDS	
39	GND		PWR	
40	NC		NC	

6.4.2 LVDS Flat Panel Connector (LVDS) (J20)

Two graphic pipes are supported; meaning that up to two independent displays can be implemented using any two of display connectors (IO Area - and Internal connectors) with the exception of the combination eDP + LVDS.

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

Note: The KTQM67 on-board LVDS connector supports single and dual channel, 18/24bit SPWG panels up to the resolution 1600x1200 or 1920x1080 and with limited frame rate some 1920x1200.

Signal Description – LVDS Flat Panel Connector:

Signal	Description
LVDS A0..A3	LVDS A Channel data
LVDS ACLK	LVDS A Channel clock
LVDS B0..B3	LVDS B Channel data
LVDS BCLK	LVDS B Channel clock
BKLTCTL	Backlight control (1), PWM signal to implement voltage in the range 0-3.3V
BKLTEN#	Backlight Enable signal (active low) (2)
VDD ENABLE	Output Display Enable.
LCDVCC	VCC supply to the display. Power-on/off sequencing depending on selected (in BIOS setup) display type. 5V or 3.3V selected in BIOS setup. LCDVCC is shared with eDP connector. Maximum load is 1A at both voltages.
DDC CLK	DDC Channel Clock

Notes: Windows API will be available to operate the BKLTCTL signal. Some Inverters have a limited voltage range 0- 2.5V for this signal: If voltage is > 2.5V the Inverter might latch up. Some Inverters generates noise on the BKLTCTL signal, resulting in making the LVDS transmission failing (corrupted picture on the display). By adding a 1Kohm resistor in series with this signal, mounted in the Inverter end of the cable kit, the noise is limited and the picture is stable.

If the Backlight Enable is required to be active high then, check the following BIOS Chipset setting: Backlight Signal Inversion = Enabled.

6.5 SATA (Serial ATA) Disk interface (J21 – J26)

The KTQM67 boards have an integrated SATA Host controller (PCH in the QM67 chipset) that supports independent DMA operation on six ports. One device can be installed on each port for a maximum of six SATA devices. A point-to-point interface (SATA cable) is used for host to device connections. Data transfer rates of up to 6.0Gb/s (typically 600MB/s) on SATA0 and SATA1 and 3.0Gb/s (typically 300MB/s) on SATA2, SATA3, SATA4 and SATA5.

Note: Before installing OS on a SATA drive make sure the drive is not a former member of a RAID system. If so some hidden data on the disk has to be erased. To do this, connect two SATA drives and select RAID in BIOS. Save settings and select <Ctrl> <I> while booting to enter the RAID setup menu. Now the hidden RAID data will be erased from the selected SATA drive.

The SATA controller supports:

2 to 6-drive RAID 0 (data striping)
2-drive RAID 1 (data mirroring)
3 to 6-drive RAID 5 (block-level striping with parity).
4-drive RAID 10 (data striping and mirroring)
2 to 6-drive matrix RAID (different parts of a single drive can be assigned to different RAID devices).
AHCI (Advanced Host Controller Interface)
NCQ (Native Command Queuing). NCQ is for faster data access.
Hot Swap
Intel® Rapid Recover Technology
2 – 256TB volume (Data volumes only)
Capacity expansion
TRIM in Windows 7 (in AHCI and RAID mode for drives not part of a RAID volume). (TRIM is for SSD data garbage handling).

The RAID (Redundant Array of Independent Drives) functionality is based on a firmware system with support for RAID modes 0 1, 5 and 10.

SATA connector pinning:
The pinout of SATA ports SATA0 (J21), SATA1 (J22), SATA2 (J23), SATA3 (J24), SATA4 (J25) and SATA5 (J26) is as follows:

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

The signals used for the primary SATA hard disk interface are the following:

Signal	Description
SATA* RX+ SATA* RX-	Host transmitter differential signal pair
SATA* TX+ SATA* TX-	Host receiver differential signal pair

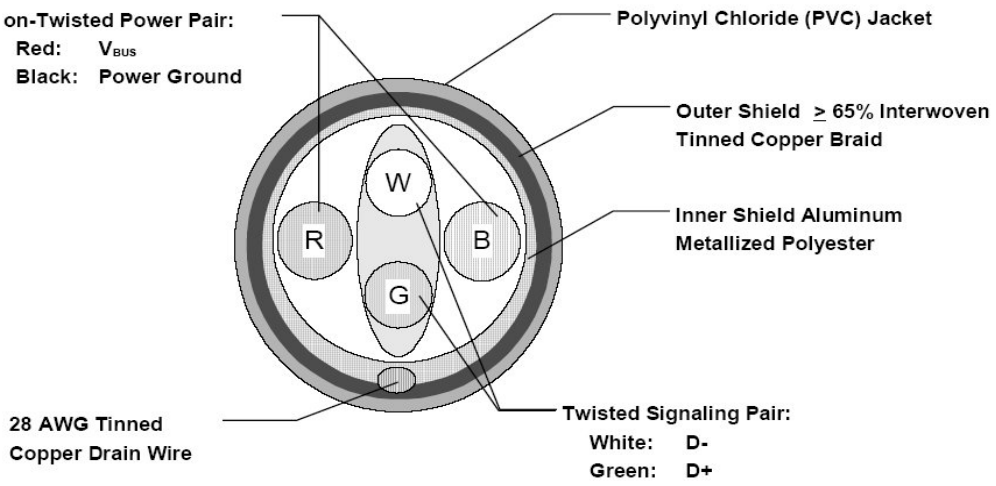
"*" specifies 0, 1, 2, 3, 4, 5 depending on SATA port.

6.6 USB Connectors (USB)

The KTQM67 board contains two EHCI (Enhanced Host Controller Interface) host controllers (EHCI1 and EHCI2) that support up to fourteen USB 2.0 ports allowing data transfers up to 480Mb/s. Legacy Keyboard/Mouse and wakeup from sleep states are supported. Over-current detection on all fourteen USB ports is supported. The following USB ports are available on Internal Pinrows:

USB Port 6 and 7 (via EHCI1) are supplied on the USB6/7 internal pinrow FRONTPNL connector.
USB Port 8 and 9 (via EHCI2) are supplied on the USB8/9 internal pinrow connector.
USB Port 10 and 11 (via EHCI2) are supplied on the USB10/11 internal pinrow connector.
USB Port 12 and 13 (via EHCI2) are supplied on the USB12/13 internal pinrow connector.

Note: It is required to use only HiSpeed USB cable, specified in USB2.0 standard:



6.6.1 USB Connector 6/7

See Frontpanel Connector (FRONTPNL) description.

6.6.2 USB Connector 8/9 (USB8/9) (J10)

USB Ports 8 and 9 are supplied on the internal USB8/9 pinrow connector J10.

Note	Type	Signal	PIN		Signal	Type	Note
1	PWR	5V/SB5V	1	2	5V/SB5V	PWR	1
	IO	USB8-	3	4	USB9-	IO	
	IO	USB8+	5	6	USB9+	IO	
	PWR	GND	7	8	GND	PWR	
	NC	KEY	9	10	NC	NC	

Signal	Description
USB8+ USB8- USB9+ USB9-	Differential pair works as Data/Address/Command Bus.
5V/SB5V	5V supply for external devices. SB5V is supplied during powerdown to allow wakeup on USB device activity. Protected by resettable 1A fuse covering both USB ports.

6.6.3 USB Connector 10/11 (USB10/11) (J11)

USB Ports 10 and 11 are supplied on the internal USB10/11 pinrow connector J11.

Note	Type	Signal	PIN		Signal	Type	Note
1	PWR	5V/SB5V	1	2	5V/SB5V	PWR	1
	IO	USB10-	3	4	USB11-	IO	
	IO	USB10+	5	6	USB11+	IO	
	PWR	GND	7	8	GND	PWR	
	NC	KEY	9	10	NC	NC	

Signal	Description
USB10+ USB10- USB11+ USB11-	Differential pair works as Data/Address/Command Bus.
5V/SB5V	5V supply for external devices. SB5V is supplied during powerdown to allow wakeup on USB device activity. Protected by resettable 1A fuse covering both USB ports.

6.6.4 USB Connector 12/13 (USB12/13) (J12)

USB Ports 12 and 13 are supplied on the internal USB12/13 pinrow connector J12.

Note	Type	Signal	PIN		Signal	Type	Note
1	PWR	5V/SB5V	1	2	5V/SB5V	PWR	1
	IO	USB12-	3	4	USB13-	IO	
	IO	USB12+	5	6	USB13+	IO	
	PWR	GND	7	8	GND	PWR	
	NC	KEY	9	10	NC	NC	

Signal	Description
USB12+ USB12- USB13+ USB13-	Differential pair works as Data/Address/Command Bus.
5V/SB5V	5V supply for external devices. SB5V is supplied during powerdown to allow wakeup on USB device activity. Protected by resettable 1A fuse covering both USB ports.

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

6.7 Firewire/IEEE1394 connectors (J13,J14)

The KTQM67 support two IEEE Std 1394a-2000 fully compliant ports at 100M bits/s, 200M bits/s and 400M bits/s.

6.7.1 IEEE1394 connector (IEEE1394_0) (J14)

Note	Pull U/D	Ioh/Iol	Type	Signal	PIN	Signal	Type	Ioh/Iol	Pull U/D	Note
	-	-		TPA0+	1 2	TPA0-		-	-	
	-	-	PWR	GND	3 4	GND	PWR	-	-	
	-	-		TPB0+	5 6	TPB0-		-	-	
1	-	-	PWR	+12V	7 8	+12V	PWR	-	-	1
key	-	-	NC	-	9 10	GND	PWR	-	-	

Note 1: The 12V supply for the IEEE1394_0 devices is on-board fused with a 1.25A reset-able fuse.

Signal	Description
TPA0+,TPA0–	Differential signal pair A
TPB0+, TPB0–	Differential signal pair B
+12V	+12V supply

6.7.2 IEEE1394 connector (IEEE1394_1) (J13)

Note	Pull U/D	Ioh/Iol	Type	Signal	PIN	Signal	Type	Ioh/Iol	Pull U/D	Note
	-	-		TPA0+	1 2	TPA0-		-	-	
	-	-	PWR	GND	3 4	GND	PWR	-	-	
	-	-		TPB0+	5 6	TPB0-		-	-	
1	-	-	PWR	+12V	7 8	+12V	PWR	-	-	1
key	-	-	NC	-	9 10	GND	PWR	-	-	

Note 1: The 12V supply for the IEEE1394_1 devices is on-board fused with a 1.25A reset-able fuse.

Signal	Description
TPA1+, TPA1–	Differential signal pair A
TPB1+, TPB1–	Differential signal pair B
+12V	+12V supply

6.8 Serial COM1 – COM4 Ports (J15, J16, J17, J18)

Four RS232 serial ports are available on the KTQM67.

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

Signal	Description
TxD	Transmitted Data, sends data to the communications link. The signal is set to the marking state (-12V) on hardware reset when the transmitter is empty or when loop mode operation is initiated.
RxD	Received Data, receives data from the communications link.
DTR	Data Terminal Ready, indicates to the modem etc. that the on-board UART is ready to establish a communication link.
DSR	Data Set Ready, indicates that the modem etc. is ready to establish a communications link.
RTS	Request To Send, indicates to the modem etc. that the on-board UART is ready to exchange data.
CTS	Clear To Send, indicates that the modem or data set is ready to exchange data.
DCD	Data Carrier Detect, indicates that the modem or data set has detected the data carrier.
RI	Ring Indicator, indicates that the modem has received a ringing signal from the telephone line.

The pinout of Serial ports COM1 (J15), COM2 (J16), COM3 (J17) and COM4 (J18) is as follows:

Note	Ioh/Iol	Type	Signal	PIN	Signal	Type	Ioh/Iol	Note
	-	I	DCD	1 2	DSR	I	-	
	-	I	RxD	3 4	RTS	O		
		O	TxD	5 6	CTS	I	-	
		O	DTR	7 8	RI	I	-	
	-	PWR	GND	9 10	5V	PWR	-	1

Note 1: The COM1, COM2, COM3 and COM4 5V supply is fused with common 1.1A resettable fuse.

DB9 adapter cables (PN 821016 200mm long and 821017 100mm long) are available for implementing standard COM ports on chassis.

6.9 LPT (Line Print Terminal – Parallel port) (J44)

The LPT connector (only KTQM67/Flex and KTQM67/ATXP) is a 32 pole single in line connector type Tyco 3-1734592-2. Available cable kit (FFC cable and module), see chapter 8.

Pin	Signal	Description	Type	Note
1	+5V		PWR	Fused by 0.8A resetable PTC fuse
2	GND		PWR	
3	RSV	Reserved	-	
4	RSV	Reserved	-	
5	RSV	Reserved	-	
6	RSV	Reserved	-	
7	NC		NC	
8	RSV	Reserved	-	
9	RSV	Reserved	-	
10	RSV	Reserved	-	
11	GND		PWR	
12	AFD#		IS	
13	STB#		IS	
14	ERROR#		O	8mA load
15	PPD0		O	8mA load
16	INIT#		IS	
17	GND		PWR	
18	PPD1		O	8mA load
19	SLIN#		IS	
20	PPD2		O	8mA load
21	PPD3		O	8mA load
22	GND		PWR	
23	PPD4		O	8mA load
24	PPD5		O	8mA load
25	PPD6		O	8mA load
26	PPD7		O	8mA load
27	GND		PWR	
28	ACK#		O	8mA load
29	BUSY		O	8mA load
30	PE		O	8mA load
31	SLCT		O	8mA load
32	GND		PWR	

Signal	Description
AFD#	Auto Line Feed, active low
STB#	Strobe, active low
ERROR#	Error, active low
PPD0 – PPD7	Parallel Port Data0 – Data7
INIT#	Initialize, active low
SLIN#	Select Input, active low
ACK#	Acknowledge, active low
BUSY	Busy, active high
PE	Paper End, active high
SLCT	Select, active high

6.10 Audio Connectors

The on-board Audio circuit implements 7.1+2 Channel High Definition Audio with UAA (Universal Audio Architecture), featuring five 24-bit stereo DACs and three 20-bit stereo ADCs.

The following Audio connectors are available as Internal connectors.

6.10.1 CDROM Audio Input (CDROM) (J3)

CD-ROM audio input may be connected to this connector or it can be used as secondary line-in signal.

PIN	Signal	Type	Note
1	CD_Left	IA	1
2	CD_GND	IA	
3	CD_GND	IA	
4	CD_Right	IA	1

Note 1: The definition of which pins are used for the Left and Right channels is not a worldwide accepted standard. Some CDROM cable kits expect reverse pin order.

Signal	Description
CD_Left CD_Right	Left and right CD audio input lines or secondary Line-in.
CD_GND	Analogue GND for Left and Right CD. (This analogue GND is **not** shorted to the general digital GND on the board).

6.10.2 Line2 and Mic2

Line2 and Mic2 are accessible via Feature Connector, see Feature connector description.

6.10.3 Audio Header Connector (AUDIO_HEAD) (J31)

Note	Type	Signal	PIN		Signal	Type	Note
	AO	LFE-OUT	1	2	CEN-OUT	AO	
	PWR	AAGND	3	4	AAGND	PWR	
1	AO	FRONT-OUT-L	5	6	FRONT-OUT-R	AO	1
	PWR	AAGND	7	8	AAGND	PWR	
	AO	REAR-OUT-L	9	10	REAR-OUT-R	AO	
	AO	SIDE-OUT-L	11	12	SIDE-OUT-R	AO	
	PWR	AAGND	13	14	AAGND	PWR	
1	AI	MIC1-L	15	16	MIC1-R	AI	1
	PWR	AAGND	17	18	AAGND	PWR	
1		LINE1-L	19	20	LINE1-R		1
	NC	NC	21	22	AAGND	PWR	
	PWR	GND	23	24	NC	NC	
	O	SPDIF-OUT	25	26	GND	PWR	

Note 1: Shared with Audio Stack connector

Signal	Description
FRONT-OUT-L	Front Speakers (Speaker Out Left).
FRONT-OUT-R	Front Speakers (Speaker Out Right).
REAR-OUT-L	Rear Speakers (Surround Out Left).
REAR-OUT-R	Rear Speakers (Surround Out Right).
SIDE-OUT-L	Side speakers (Surround Out Left)
SIDE-OUT-R	Side speakers (Surround Out Right)
CEN-OUT	Center Speaker (Center Out channel).
LFE-OUT	Subwoofer Speaker (Low Freq. Effect Out).
NC	No connection
MIC1	MIC Input 1
LINE1	Line 1 signals
F-SPDIF-OUT	S/PDIF Output
AAGND	Audio Analogue ground

6.11 Front Panel Connector (FRONTPNL) (J19)

Note	Pull U/D	Ioh/ Iol	Type	Signal	PIN		Signal	Type	Ioh/ Iol	Pull U/D	Note
	-	-	PWR	USB6/7_5V	1	2	USB6/7_5V	PWR	-	-	
	-	-		USB6-	3	4	USB7-		-	-	
	-	-		USB6+	5	6	USB7+		-	-	
	-	-	PWR	GND	7	8	GND	PWR	-	-	
	-	-	NC	NC	9	10	LINE2-L		-	-	
	-	-	PWR	+5V	11	12	+5V	PWR	-	-	
	-	25/25mA	O	SATA_LED#	13	14	SUS_LED	O	7mA	-	
	-	-	PWR	GND	15	16	PWRBTN_IN#	I		1K1	
	4K7	-	I	RSTIN#	17	18	GND	PWR	-	-	
	-	-	PWR	SB3V3	19	20	LINE2-R		-	-	
	-	-	PWR	AGND	21	22	AGND	PWR	-	-	
	-	-	AI	MIC2-L	23	24	MIC2-R	AI	-	-	

Signal	Description
USB10/11_5V	5V supply for external devices. SB5V is supplied during powerdown to allow wakeup on USB device activity. Protected by resettable 1.1A fuse covering both USB ports.
USB1+ USB1-	Universal Serial Bus Port 1 Differentials: Bus Data/Address/Command Bus.
USB3+ USB3-	Universal Serial Bus Port 3 Differentials: Bus Data/Address/Command Bus.
+5V	Maximum load is 1A or 2A per pin if using IDC connector flat cable or crimp terminals respectively.
SATA_LED#	SATA Activity LED (active low signal). 3V3 output when passive.
SUS_LED	Suspend Mode LED (active high signal). Output 3.3V via 470Ω.
PWRBTN_IN#	Power Button In. Toggle this signal low to start the ATX / BTX PSU and boot the board.
RSTIN#	Reset Input. When pulled low for a minimum 16ms, the reset process will be initiated. The reset process continues even though the Reset Input is kept low.
LINE2	Line2 is second stereo Line signals
MIC2	MIC2 is second stereo microphone input.
SB3V3	Standby 3.3V voltage
AGND	Analogue Ground for Audio

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

6.12 Feature Connector (FEATURE) (J30)

Note	Pull U/D	Ioh/Iol	Type	Signal	PIN		Signal	Type	Ioh/Iol	Pull U/D	Note
2	2M/	-	I	CASE_OPEN#	1	2	SMBC		/4mA	10K/	1
	-	25/25mA	O	S5#	3	4	SMBD		/4mA	10K/	1
	-	25/25mA	O	PWR_OK	5	6	EXT_BAT	PWR	-	-	
	-		O	FAN3OUT	7	8	FAN3IN	I	-	-	
	-	-	PWR	SB3V3	9	10	SB5V	PWR	-	-	
	-		IOT	GPIO0	11	12	GPIO1	IOT		-	
	-		IOT	GPIO2	13	14	GPIO3	IOT		-	
	-		IOT	GPIO4	15	16	GPIO5	IOT		-	
	-		IOT	GPIO6	17	18	GPIO7	IOT		-	
	-	-	PWR	GND	19	20	GND	PWR	-	-	
	-		I	GPIO8	21	22	GPIO9	I		-	
	-		I	GPIO10	23	24	GPIO11	I		-	
	-		I	GPIO12	25	26	GPIO13	IOT		-	
	-		IOT	GPIO14	27	28	GPIO15	IOT		-	
	-		IOT	GPIO16	29	30	GPIO17	IOT		-	
	-	-	PWR	GND	31	32	GND	PWR	-	-	
	-	8/8mA	O	EGCLK	33	34	EGCS#	O	8/8mA	-	
	-	8/8mA		EGAD	35	36	TMA0	O			
	-		PWR	+12V	37	38	GND	PWR	-	-	
	-		O	FAN4OUT	39	40	FAN4IN	I	-	-	
	-	-	PWR	GND	41	42	GND	PWR	-	-	
	-	-	PWR	GND	43	44	S3#	O	25/25mA	-	

Notes: **1**. Pull-up to +3V3Dual (+3V3 or SB3V3). **2**. Pull-up to on-board Battery. **3**. Pull-up to +3V3.

Signal	Description
CASE_OPEN#	CASE OPEN, used to detect if the system case has been opened. This signal's status is readable, so it may be used like a GPI when the Intruder switch is not required.
SMBC	SMBus Clock signal
SMBD	SMBus Data signal
S3#	S3 sleep mode, active low output, optionally used to deactivate external system.
S5#	S5 sleep mode, active low output, optionally used to deactivate external system.
PWR_OK	PoWeR OK, signal is high if no power failures are detected. (This is not the same as the P_OK signal generated by ATX PSU).
EXT_BAT	(EXTernal BATtery) option for connecting + terminal of an external primary cell battery (2.5 - 4.0 V) (– terminal connected to GND etc. pin 20). The external battery is protected against charging and can be used with or without the on-board battery installed.
FAN3OUT	FAN 3 speed control OUTput, 3.3V PWM signal can be used as Fan control voltage.
FAN3IN	FAN3 Input. 0V to +3V3 amplitude Fan 3 tachometer input.
FAN4OUT	FAN 4 speed control OUTput, 3.3V PWM signal can be used as Fan control voltage.
FAN4IN	FAN4 Input. 0V to +3V3 amplitude Fan 3 tachometer input.
SB3V3	Max. load is 0.75A (1.5A < 1 sec.)
SB5V	StandBy +5V supply.
GPIO0..17	General Purpose Inputs / Output. These Signals may be controlled or monitored through the use of the KT-API-V2 (Application Programming Interface).
EGCLK	Extend GPIO Clock signal
EGAD	Extend GPIO Address Data signal
EGCS#	Extend GPIO Chip Select signal, active low
TMA0	Timer Output
+12V	Max. load is 0.75A (1.5A < 1 sec.)

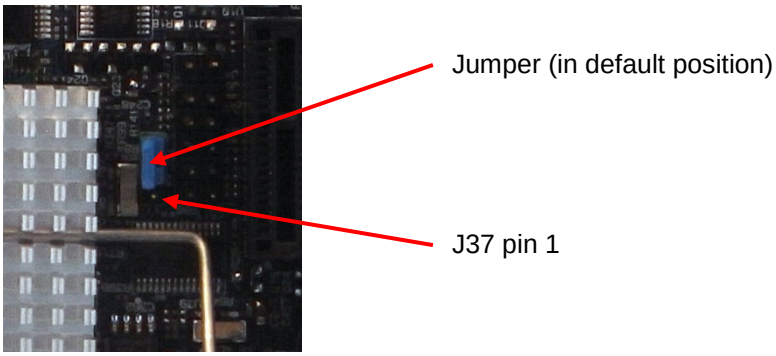
GPIO in more details.

The GPIO's are controlled via the ITE IT8516F Embedded Controller. Each GPIO has 100pF to ground, clamping Diode to 3V3 and has multiplexed functionality. Some pins can be DAC (Digital to Analogue Converter output), PWM (Pulse Width Modulated signal output), ADC (Analogue to Digital Converter input), TMRI (Timer Counter Input), WUI (Wake Up Input), RI (Ring Indicator Input) or some special function.

Signal	IT8516F pin name	Type	+5V tolerant	Description
GPIO0	DAC0/GPJ0	AO/IOS	No	
GPIO1	DAC1/GPJ1	AO/IOS	No	
GPIO2	DAC2/GPJ2	AO/IOS	No	
GPIO3	DAC3/GPJ3	AO/IOS	No	
GPIO4	PWM2/GPA2	O8/IOS	Yes	
GPIO5	PWM3/GPA3	O8/IOS	Yes	
GPIO6	PWM4/GPA4	O8/IOS	Yes	
GPIO7	PWM5/GPA5	O8/IOS	Yes	
GPIO8	ADC0/GPI0	AI/IS	No	
GPIO9	ADC1/GPI1	AI/IS	No	
GPIO10	ADC2/GPI2	AI/IS	No	
GPIO11	ADC3/GPI3	AI/IS	No	
GPIO12	ADC4/WUI28/GPI4	AI/IS/IS	No	
GPIO13	RI1#/WUI0/GPD0	IS/IS/IOS	Yes	
GPIO14	RI2#/WUI1/GPD1	IS/IS/IOS	Yes	
GPIO15	TMRI0/WUI2/GPC4	IS/IS/IOS	Yes	
GPIO16	TMRI1/WUI3/GPC6	IS/IS/IOS	Yes	
GPIO17	L80HLAT/BAO/WUI24/GPE0	O4/O4/IS/IOS	Yes	

6.13 Clear CMOS Jumper (J37)

The Clear-CMOS Jumper (J37) is used to clear the CMOS content.



J37		
pin1-2	pin2-3	Description
X	-	Clear CMOS data
-	X	Default positions
-	-	Secure CMOS function is disabled and Default values are used

Warning: Don't leave the jumper in position 1-2, otherwise the battery will fully depleted within a few weeks if power is disconnected.

To clear CMOS settings, including Password protection, move the Clear CMOS jumper to pin 1-2 for a few seconds (~10 sec) (works with or without power connected to the system).

To disable the Secure CMOS function (selected in BIOS), remove the jumper completely from J37.

Leave the Jumper in position 2-3 (default position).

6.14 SPI Recover Jumper (J4)

The SPI Recover Jumper is used to select BIOS Recovery Flash instead of BIOS Default Flash. Normally SPI Recovery Jumper is not installed and board boots on the BIOS Default Flash. Only in case the Default BIOS gets corrupted (board do not boot) follow the procedure:

1. First try to use the Clear CMOS Jumper, see previous page. If problem remains then continue.
2. Turn off power.
3. Install "SPI Recover Jumper"(J4).
4. Reboot.
5. Upgrade the BIOS.
6. When BIOS upgrade is completed then turn off power completely (inclusive Standby +5V).
7. Remove "SPI Recover Jumper".
8. Wait for 1 minute.
9. Turn on power. System will automatically reboot 4-5 times within 1 minute.

6.15 SPI Connector (SPI) (J5)

The SPI Connector is normally not used. If however a SPI BIOS is connected via the SPI Connector then the board will try to boot on it.

Note	Pull U/D	Ioh/Iol	Type	Signal	PIN		Signal	Type	Ioh/Iol	Pull U/D	Note
	-			CLK	1	2	SB3V3	PWR	-	-	
	-		I	CS0#	3	4	ADDIN	IO		/10K	
	10K/		-	NC	5	6	NC	-	-	-	
	10K/		IO	MOSI	7	8	ISOLATE#	IO		100K	
	-		IO	MISO	9	10	GND	PWR	-	-	

Signal	Description
CLK	Serial Clock
SB3V3	3.3V Standby Voltage power line. Normally output power, but when Motherboard is turned off then the on-board SPI Flash can be 3.3V power sourced via this pin.
CS0#	CS0# Chip Select 0, active low.
ADDIN	ADDIN input signal must be NC.
MOSI	Master Output, Slave Input
ISOLATE#	The ISOLATE# input, active low, is normally NC, but must be connected to GND when loading SPI flash. Power Supply to the Motherboard must be turned off when loading SPI flash. The pull up resistor is connected via diode to 5VSB.
MISO	Master Input, Slave Output

6.16 XDP-CPU (Debug Port for CPU) (J32)

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

Pin	Signal	Description	Type	Pull Up/Down	Note
1	OBSFN_A0				
2	OBSFN_A1				
3	GND		PWR	-	
4	NC		NC	-	
5	NC		NC	-	
6	GND		PWR	-	
7	NC		NC	-	
8	NC		NC	-	
9	GND		PWR	-	
10	HOOK0				
11	HOOK1				
12	HOOK2				
13	HOOK3				
14	HOOK4				
15	HOOK5				
16	+5V		PWR	-	
17	HOOK6				
18	HOOK7			500R	(500R by 2x1K in parallel)
19	GND		PWR	-	
20	TDO			/51R	
21	TRST#			/51R	
22	TDI			/51R	
23	TMS			/51R	
24	NC		NC	-	
25	GND		PWR	-	
26	TCK0			/51R	

6.17 XDP-PCH (Debug Port for Chipset) (J33)

The XDP-PCH (Intel Debug Port for Chipset) connector is not mounted and not supported. XDP-PCH connector layout (pads) is located on the backside of PCB (below J35 connector on mITX version) and is prepared for the Molex 52435-2671 (or 52435-2672).

Pin	Signal	Description	Type	Pull Up/Down	Note
1	NC		NC	-	
2	NC		NC	-	
3	GND		PWR	-	
4	NC		NC	-	
5	NC		NC	-	
6	GND		PWR	-	
7	NC		NC	-	
8	NC		NC	-	
9	GND		PWR	-	
10	HOOK0	RSMRST#			Connected to HOOK6
11	HOOK1	PWRBTN#			
12	HOOK2		NC	-	
13	HOOK3		NC	-	
14	HOOK4		NC	-	
15	HOOK5		NC	-	
16	+5V		PWR	-	
17	HOOK6				Connected to HOOK1
18	HOOK7	RESET#		500R	(500R by 2x1K in parallel)
19	GND		PWR	-	
20	TDO			210R/100R	
21	TRST#				
22	TDI			210R/100R	
23	TMS			210R/100R	
24	NC		NC	-	
25	GND		PWR	-	
26	TCK0			/51R	

7 Slot Connectors (PCIe, miniPCIe, PCI)

7.1 PCIe Connectors

All members of the KTQM67 family supports one (x16) (16-lane) PCI Express port, one x1 PCI Express port and two miniPCI Express ports.

The **16-lane (x16) PCI Express** (PCIe 2.0) port can be used for external PCI Express cards inclusive graphics card. It is located nearest the CPU. Maximum theoretical bandwidth using 16 lanes is 16 GB/s. PCIe x1, PCIe x2, PCIe x4, PCIe x8 and PCIe x16 are supported; however PCIe x2 is only supported when using 3rd generation Intel® Core™ processor (Ivy Bridge).

The two **miniPCIe** (PCIe 2.0) is located on the backside of the board.

The **1-lane (x1) PCI Express** (PCIe 2.0) can be used for any PCIex1 cards inclusive “Riser PCIex1 to PCI Dual flexible card“.

7.1.1 PCI-Express x16 Connector (PCIe x16)

Note	Type	Signal	PIN		Signal	Type	Note
		+12V	B1	A1	NC		
		+12V	B2	A2	+12V		
		+12V	B3	A3	+12V		
		GND	B4	A4	GND		
		SMB_CLK	B5	A5	NC		
		SMB_DATA	B6	A6	NC		
		GND	B7	A7	NC		
		+3V3	B8	A8	NC		
		NC	B9	A9	+3V3		
		SB3V3	B10	A10	+3V3		
		WAKE#	B11	A11	RST#		
		NC	B12	A12	GND		
		GND	B13	A13	PCIE_x16 CLK		
		PEG_TXP[0]	B14	A14	PCIE_x16 CLK#		
		PEG_TXN[0]	B15	A15	GND		
		GND	B16	A16	PEG_RXP[0]		
		CLKREQ	B17	A17	PEG_RXN[0]		
		GND	B18	A18	GND		
		PEG_TXP[1]	B19	A19	NC		
		PEG_TXN[1]	B20	A20	GND		
		GND	B21	A21	PEG_RXP[1]		
		GND	B22	A22	PEG_RXN[1]		
		PEG_TXP[2]	B23	A23	GND		
		PEG_TXN[2]	B24	A24	GND		
		GND	B25	A25	PEG_RXP[2]		
		GND	B26	A26	PEG_RXN[2]		
		PEG_TXP[3]	B27	A27	GND		
		PEG_TXN[3]	B28	A28	GND		
		GND	B29	A29	PEG_RXP[3]		
		NC	B30	A30	PEG_RXN[3]		
		CLKREQ	B31	A31	GND		
		GND	B32	A32	NC		
		PEG_TXP[4]	B33	A33	NC		
		PEG_TXN[4]	B34	A34	GND		
		GND	B35	A35	PEG_RXP[4]		

		GND	B36	A36	PEG_RXN[4]		
		PEG_TXP[5]	B37	A37	GND		
		PEG_TXN[5]	B38	A38	GND		
		GND	B39	A39	PEG_RXP[5]		
		GND	B40	A40	PEG_RXN[5]		
		PEG_TXP[6]	B41	A41	GND		
		PEG_TXN[6]	B42	A42	GND		
		GND	B43	A43	PEG_RXP[6]		
		GND	B44	A44	PEG_RXN[6]		
		PEG_TXP[7]	B45	A45	GND		
		PEG_TXN[7]	B46	A46	GND		
		GND	B47	A47	PEG_RXP[7]		
		CLKREQ	B48	A48	PEG_RXN[7]		
		GND	B49	A49	GND		
		PEG_TXP[8]	B50	A50	NC		
		PEG_TXN[8]	B51	A51	GND		
		GND	B52	A52	PEG_RXP[8]		
		GND	B53	A53	PEG_RXN[8]		
		PEG_TXP[9]	B54	A54	GND		
		PEG_TXN[9]	B55	A55	GND		
		GND	B56	A56	PEG_RXP[9]		
		GND	B57	A57	PEG_RXN[9]		
		PEG_TXP[10]	B58	A58	GND		
		PEG_TXN[10]	B59	A59	GND		
		GND	B60	A60	PEG_RXP[10]		
		GND	B61	A61	PEG_RXN[10]		
		PEG_TXP[11]	B62	A62	GND		
		PEG_TXN[11]	B63	A63	GND		
		GND	B64	A64	PEG_RXP[11]		
		GND	B65	A65	PEG_RXN[11]		
		PEG_TXP[12]	B66	A66	GND		
		PEG_TXN[12]	B67	A67	GND		
		GND	B68	A68	PEG_RXP[12]		
		GND	B69	A69	PEG_RXN[12]		
		PEG_TXP[13]	B70	A70	GND		
		PEG_TXN[13]	B71	A71	GND		
		GND	B72	A72	PEG_RXP[13]		
		GND	B73	A73	PEG_RXN[13]		
		PEG_TXP[14]	B74	A74	GND		
		PEG_TXN[14]	B75	A75	GND		
		GND	B76	A76	PEG_RXP[14]		
		GND	B77	A77	PEG_RXN[14]		
		PEG_TXP[15]	B78	A78	GND		
		PEG_TXN[15]	B79	A79	GND		
		GND	B80	A80	PEG_RXP[15]		
		CLKREQ	B81	A81	PEG_RXN[15]		
		NC	B82	A82	GND		

7.1.2 miniPCI-Express mPCIe0 (J34)

The miniPCI Express port mPCIe0 is located on the backside.

Beside miniPCIe cards the mPCIe0 also supports mSATA SSD cards.

Note: no USB signals are available.

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

Note 1: 10K ohm pull-up to 3V3.
Note 2: 2K2 ohm pull-up to 3V3 Dual.
Note 3: 100K ohm pull-up to 1V8 (S0 mode)

7.1.3 miniPCI-Express mPCIe1 (J35)

The miniPCI Express port mPCIe1 is located on the backside.

Note: no USB or mSATA signals are available.

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

Note 1: 10K ohm pull-up to 3V3 Dual.
Note 2: 2K2 ohm pull-up to 3V3 Dual.

7.1.4 PCI-Express x1 Connector (PCIe x1) (J36)

The KTQM67/mITX supports one PCIe x1.

Note	Type	Signal	PIN		Signal	Type	Note
	PWR	+12V	B1	A1	GND	PWR	
	PWR	+12V	B2	A2	+12V	PWR	
	PWR	+12V	B3	A3	+12V	PWR	
	PWR	GND	B4	A4	GND	PWR	
		SMB_CLK	B5	A5	CL_CLK		
		SMB_DATA	B6	A6	CL_RST		
	PWR	GND	B7	A7	SMB_ALERT		
	PWR	+3V3	B8	A8	CL_DATA		
2		JTAG_TEST#	B9	A9	+3V3	PWR	
	PWR	3V3 Dual	B10	A10	+3V3	PWR	
		WAKE#	B11	A11	RST#		
	NC	NC	B12	A12	GND	PWR	
	PWR	GND	B13	A13	PCIE_CLK_P		
		PCIE_TXP	B14	A14	PCIE_CLK_N		
		PCIE_TXN	B15	A15	GND	PWR	
	PWR	GND	B16	A16	PCIE_RXP		
1		CLK_REQ	B17	A17	PCIE_RXN		
	PWR	GND	B18	A18	GND	PWR	

Note 1: 10K ohm pull-up to 3V3 Dual.
Note 2: 4K7 ohm pull-down to GND.

7.2 PCI Slot Connectors

KTQM67/Flex support 3 PCI slots PCI0 (J45), PCI1 (J48), PCI2 (J49) and KTQM67/ATXP supports 6 PCI slots PCI0 (J45), PCI1 (J48), PCI2 (J49) PCI3 (J54), PCI4 (J53), PCI5 (J55).
KTQm67/mITX doesn't support PCI slots, but optionally PCIex1 to PCI Dual Flexible Riser can be used.

Note	Type	Signal	Terminal S	Terminal C	Signal	Type	Note
	PWR	-12V	F01	E01	TRST#	O	
	O	TCK	F02	E02	+12V	PWR	
	PWR	GND	F03	E03	TMS	O	
NC	I	TDO	F04	E04	TDI	O	
	PWR	+5V	F05	E05	+5V	PWR	
	PWR	+5V	F06	E06	INTA#	I	
	I	INTB#	F07	E07	INTC#	I	
	I	INTD#	F08	E08	+5V	PWR	
NC	-	-	F09	E09	-	-	NC
NC	-	-	F10	E10	+5V (I/O)	PWR	
NC	-	-	F11	E11	-	-	NC
	PWR	GND	F12	E12	GND	PWR	
	PWR	GND	F13	E13	GND	PWR	
NC	-	-	F14	E14	GNT3#	OT	
	PWR	GND	F15	E15	RST#	O	
	O	CLKB	F16	E16	+5V (I/O)	PWR	
	PWR	GND	F17	E17	GNT0#	OT	
	I	REQ0#	F18	E18	GND	PWR	
	PWR	+5V (I/O)	F19	E19	PME#	I	
	IOT	AD31	F20	E20	AD30	IOT	
	IOT	AD29	F21	E21	+3.3V	PWR	
	PWR	GND	F22	E22	AD28	IOT	
	IOT	AD27	F23	E23	AD26	IOT	
	IOT	AD25	F24	E24	GND	PWR	
	PWR	+3.3V	F25	E25	AD24	IOT	
	IOT	C/BE3#	F26	E26	GNT1#	OT	
	IOT	AD23	F27	E27	+3.3V	PWR	
	PWR	GND	F28	E28	AD22	IOT	
	IOT	AD21	F29	E29	AD20	IOT	
	IOT	AD19	F30	E30	GND	PWR	
	PWR	+3.3V	F31	E31	AD18	IOT	
	IOT	AD17	F32	E32	AD16	IOT	
	IOT	C/BE2#	F33	E33	+3.3V	PWR	
	PWR	GND	F34	E34	FRAME#	IOT	
	IOT	IRDY#	F35	E35	GND	PWR	
	PWR	+3.3V	F36	E36	TRDY#	IOT	
	IOT	DEVSEL#	F37	E37	GND	PWR	
	PWR	GND	F38	E38	STOP#	IOT	
	IOT	LOCK#	F39	E39	+3.3V	PWR	
	IOT	PERR#	F40	E40	SDONE	IO	
	PWR	+3.3V	F41	E41	SB0#	IO	
	IOC	SERR#	F42	E42	GND	PWR	
	PWR	+3.3V	F43	E43	PAR	IOT	
	IOT	C/BE1#	F44	E44	AD15	IOT	
	IOT	AD14	F45	E45	+3.3V	PWR	
	PWR	GND	F46	E46	AD13	IOT	
	IOT	AD12	F47	E47	AD11	IOT	
	IOT	AD10	F48	E48	GND	PWR	
	PWR	GND	F49	E49	AD09	IOT	
SOLDER SIDE					**COMPONENT SIDE**		
	IOT	AD08	F52	E52	C/BE0#	IOT	
	IOT	AD07	F53	E53	+3.3V	PWR	
	PWR	+3.3V	F54	E54	AD06	IOT	
	IOT	AD05	F55	E55	AD04	IOT	
	IOT	AD03	F56	F56	GND	PWR	
	PWR	GND	F57	E57	AD02	IOT	
	IOT	AD01	F58	E58	AD00	IOT	
	PWR	+5V (I/O)	F59	E59	+5V (I/O)	PWR	
	IOT	ACK64#	F60	E60	REQ64#	IOT	
	PWR	+5V	F61	E61	+5V	PWR	
	PWR	+5V	F62	E62	+5V	PWR	

7.2.1 Signal Description – PCI Slot Connector

SYSTEM PINS	
CLK	Clock provides timing for all transactions on PCI and is an input to every PCI device. All other PCI signals, except RST#, INTA#, INTB#, INTC#, and INTD#, are sampled on the risingedge of CLK and all other timing parameters are defined with respect to this edge. PCI operates at 33MHz.
PME#	Power Management Event interrupt signal. Wake up signal.
RST#	Reset is used to bring PCI-specific registers, sequencers, and signals to a consistent state. What effect RST# has on a device beyond the PCI sequencer is beyond the scope of this specification, except for reset states of required PCI configuration registers. Anytime RST# is asserted, all PCI output signals must be driven to their benign state. In general, this means they must be asynchronously tri-stated. SERR# (open drain) is floated. REQ# and GNT# must both be tri-stated (they cannot be driven low or high during reset). To prevent AD, C/BE#, and PAR signals from floating during reset, the central resource may drive these lines during reset (bus parking) but only to a logic low level–they may not be driven high. RST# may be asynchronous to CLK when asserted or deasserted. Although asynchronous, deassertion is guaranteed to be a clean, bounce-free edge. Except for configuration accesses, only devices that are required to boot the system will respond after reset.
ADDRESS AND DATA	
AD[31::00]	Address and Data are multiplexed on the same PCI pins. A bus transaction consists of an address phase followed by one or more data phases. PCI supports both read and write bursts. The address phase is the clock cycle in which FRAME# is asserted. During the address phase AD[31::00] contain a physical address (32 bits). For I/O, this is a byte address; for configuration and memory, it is a DWORD address. During data phases AD[07::00] contain the least significant byte (lsb) and AD[31::24] contain the most significant byte (msb). Write data is stable and valid when IRDY# is asserted and read data is stable and valid when TRDY# is asserted. Data is transferred during those clocks where both IRDY# and TRDY# are asserted.
C/BE[3::0]#	Bus Command and Byte Enables are multiplexed on the same PCI pins. During the address phase of a transaction, C/BE[3::0]# define the bus command. During the data phase C/BE[3::0]# are used as Byte Enables. The Byte Enables are valid for the entire data phase and determine which byte lanes carry meaningful data. C/BE[0]# applies to byte 0 (lsb) and C/BE[3]# applies to byte 3 (msb).
PAR	Parity is even parity across AD[31::00] and C/BE[3::0]#. Parity generation is required by all PCI agents. PAR is stable and valid one clock after the address phase. For data phases, PAR is stable and valid one clock after either IRDY# is asserted on a write transaction or TRDY# is asserted on a read transaction. Once PAR is valid, it remains valid until one clock after the completion of the current data phase. (PAR has the same timing as AD[31::00], but it is delayed by one clock.) The master drives PAR for address and write data phases; the target drives PAR for read data phases.
INTERFACE CONTROL PINS	
FRAME#	Cycle Frame is driven by the current master to indicate the beginning and duration of an access. FRAME# is asserted to indicate a bus transaction is beginning. While FRAME# is asserted, data transfers continue. When FRAME# is deasserted, the transaction is in the final data phase or has completed.
IRDY#	Initiator Ready indicates the initiating agent's (bus master's) ability to complete the current data phase of the transaction. IRDY# is used in conjunction with TRDY#. A data phase is completed on any clock both IRDY# and TRDY# are sampled asserted. During a write, IRDY# indicates that valid data is present on AD[31::00]. During a read, it indicates the master is prepared to accept data. Wait cycles are inserted until both IRDY# and TRDY# are asserted together.
TRDY#	Target Ready indicates the target agent's (selected device's) ability to complete the current data phase of the transaction. TRDY# is used in conjunction with IRDY#. A data phase is completed on any clock both TRDY# and IRDY# are sampled asserted. During a read, TRDY# indicates that valid data is present on AD[31::00]. During a write, it indicates the target is prepared to accept data. Wait cycles are inserted until both IRDY# and TRDY# are asserted together.
STOP#	Stop indicates the current target is requesting the master to stop the current transaction.
LOCK#	Lock indicates an atomic operation that may require multiple transactions to complete. When LOCK# is asserted, non-exclusive transactions may proceed to an address that is not currently locked. A grant to start a transaction on PCI does not guarantee control of LOCK#. Control of LOCK# is obtained under its own protocol in conjunction with GNT#. It is possible for different agents to use PCI while a single master retains ownership of LOCK#. If a device implements Executable Memory, it should also implement LOCK# and guarantee complete access exclusion in that memory. A target of an access that supports LOCK# must provide exclusion to a minimum of 16 bytes (aligned). Host bridges that have system memory behind them should implement LOCK# as a target from the PCI bus point of view and optionally as a master.
IDSEL	Initialization Device Select is used as a chip select during configuration read and write transactions.
DEVSEL#	Device Select, when actively driven, indicates the driving device has decoded its address as the target of the current access. As an input, DEVSEL# indicates whether any device on the bus has been selected.

ARBITRATION PINS (BUS MASTERS ONLY)	
REQ#	Request indicates to the arbiter that this agent desires use of the bus. This is a point to point signal. Every master has its own REQ# which must be tri-stated while RST# is asserted.
GNT#	Grant indicates to the agent that access to the bus has been granted. This is a point to point signal. Every master has its own GNT# which must be ignored while RST# is asserted. While RST# is asserted, the arbiter must ignore all REQ# lines since they are tri-stated and do not contain a valid request. The arbiter can only perform arbitration after RST# is deasserted. A master must ignore its GNT# while RST# is asserted. REQ# and GNT# are tri-state signals due to power sequencing requirements when 3.3V or 5.0V only add-in boards are used with add-in boards that use a universal I/O buffer.
ERROR REPORTING PINS. The error reporting pins are required by all devices and maybe asserted when enabled	
PERR#	Parity Error is only for the reporting of data parity errors during all PCI transactions except a Special Cycle. The PERR# pin is sustained tri-state and must be driven active by the agent receiving data two clocks following the data when a data parity error is detected. The minimum duration of PERR# is one clock for each data phase that a data parity error is detected. (If sequential data phases each have a data parity error, the PERR# signal will be asserted for more than a single clock.) PERR# must be driven high for one clock before being tri-stated as with all sustained tri-state signals. There are no special conditions when a data parity error may be lost or when reporting of an error may be delayed. An agent cannot report a PERR# until it has claimed the access by asserting DEVSEL# (for a target) and completed a data phase or is the master of the current transaction.
SERR#	System Error is for reporting address parity errors, data parity errors on the Special Cycle command, or any other system error where the result will be catastrophic. If an agent does not want a non-maskable interrupt (NMI) to be generated, a different reporting mechanism is required. SERR# is pure open drain and is actively driven for a single PCI clock by the agent reporting the error. The assertion of SERR# is synchronous to the clock and meets the setup and hold times of all bused signals. However, the restoring of SERR# to the deasserted state is accomplished by a weak pullup (same value as used for s/t/s) which is provided by the system designer and not by the 68signaling agent or central resource. This pull-up may take two to three clock periods to fully restore SERR#. The agent that reports SERR#s to the operating system does so anytime SERR# is sampled asserted.
INTERRUPT PINS (OPTIONAL). Interrupts on PCI are optional and defined as “level sensitive,” asserted low (negative true), using open drain output drivers. The assertion and deassertion of INTx# is asynchronous to CLK. A device asserts its INTx# line when requesting attention from its device driver. Once the INTx# signal is asserted, it remains asserted until the device driver clears the pending request. When the request is cleared, the device deasserts its INTx# signal. PCI defines one interrupt line for a single function device and up to four interrupt lines for a multi-function device or connector. For a single function device, only INTA# may be used while the other three interrupt lines have no meaning.	
INTA#	Interrupt A is used to request an interrupt.
INTB#	Interrupt B is used to request an interrupt and only has meaning on a multi-function device.
INTC#	Interrupt C is used to request an interrupt and only has meaning on a multi-function device.
INTD#	Interrupt D is used to request an interrupt and only has meaning on a multi-function device.

7.2.2 KTQM67 PCI IRQ & INT routing

Board type	Slot	REQ	GNT	IDSEL	INTA	INTB	INTC	INTD
KTQM67/Flex	0	REQ0	GNT0	17	INTA	INTB	INTC	INTD
	1	REQ1	GNT1	18	INTB	INTC	INTD	INTA
	2	REQ2	GNT2	19	INTC	INTD	INTA	INTB
KTQM67/ATXP	0	REQ0	GNT0	17	INTA	INTB	INTC	INTD
	1	REQ1	GNT1	18	INTB	INTC	INTD	INTA
	2	REQ2	GNT2	19	INTC	INTD	INTA	INTB
	3	REQ3	GNT3	20	INTD	INTA	INTB	INTC
	4	REQ4	GNT4	21	INTA	INTB	INTC	INTD
	5	REQ5	GNT5	22	INTB	INTC	INTD	INTA

8 On-board - & mating connector types

The Mating connectors / Cables are connectors or cable kits which are fitting the On-board connector. The highlighted cable kits are included in the “KTQM67 Cable & Driver Kit” PN 826598, in different quantities depending on type of connector. For example there is 4 x 821017 COM cables and 6 x 821035 SATA cables.

Connector	On-board Connectors		Mating Connectors / Cables	
	Manufacturer	Type no.	Manufacturer	Type no.
FAN_CPU	Foxconn	HF2704E-M1	AMP	1375820-4 (4-pole)
FAN_SYS	AMP	1470947-1	AMP	1375820-3 (3-pole)
KBDMSE	Molex	22-23-2061	Molex	22-01-2065
			Kontron	**KT 1046-3381**
CDROM	Foxconn	HF1104E	Molex	50-57-9404
	Molex	70543-0038		
SATA	Hon Hai	LD1807V-S52T	Molex	67489-8005
			Kontron	**KT 821035** (cable kit)
ATXPWR	Molex	44206-0002	Molex	5557-24R
ATX+12V-4pin	Lotes	ABA-POW-003-K02	Molex	39-01-2045
LPT	Tyco	3-1734592-2	Kontron	**KT 1045-9287** (FFC) **KT 1045-9290** (FFC) **KT 1046-3057** (module)
EDP	Tyco	5-2069716-3	Tyco	2023344-3
LVDS	Don Connex	C44-40BSB1-G	Don Connex	A32-40-C-G-B-1
			Kontron	KT 910000005
			Kontron	**KT 821515** (cable kit)
			Kontron	KT 821155 (cable kit)
COM1,2, 3, 4	Wuerth	61201020621	Molex	90635-1103
			Kontron	KT 821016 (cable kit)
			Kontron	**KT 821017** (cable kit)
USB68/9, 10/11, 12/13	Pinrex	512-90-10GBB2	Kontron	**KT 821401** (cable kit)
USB6/7 (*)	(FRONTPNL)	-	Kontron	**KT 821401** (cable kit)
IEEE1394_0/1	Foxconn	HS1105F-RNP9	Kontron	**KT 821040** (cable kit)
AUDIO_HEAD	Molex	87831-2620	Molex	51110-2651
			Kontron	**KT 821043** (cable kit)
FRONTPNL	Pinrex	512-90-24GBB3	Molex	90635-1243
			Kontron	**KT 821042** (cable kit)
FEATURE	Foxconn	HS5422F	Don Connex	A05c-44-B-G-A-1-G

* USB6/USB7 is located in FRONTPNL connector. Depending on application KT 821401 can be used.

Note: Only one connector will be mentioned for each type of on-board connector even though several types with same fit, form and function are approved and could be used as alternative. Please also notice that standard connectors like DVI, DP, PCIe, miniPCIe, PCI, Audio Jack, Ethernet and USB is not included in the list.

9 System Resources

9.1 Memory Map

Address (hex)		Size (hex)	Description
0xFF000000	0xFFFFFFFF	1000000	Intel® 82802 Firmware Hub Device Motherboard resources
0xFEE00000	0xFEEFFFFF	100000	Motherboard resources
0xFED90000	0xFED93FFF	4000	Motherboard resources
0xFED45000	0xFED8FFFF	4B000	Motherboard resources
0xFED40000	0xFED44FFF	5000	System board
0xFED20000	0xFED3FFFF	20000	Motherboard resources
0xFED1C000	0xFED1FFFF	4000	Motherboard resources
0xFED19000	0xFED19FFF	1000	Motherboard resources
0xFED18000	0xFED18FFF	1000	Motherboard resources
0xFED10000	0xFED17FFF	8000	Motherboard resources
0xFED00000	0xFED003FF	400	High Precision Event Timer
0xF8000000	0xFBFFFFFF	4000000	Motherboard resources
0xF7F2B000	0xF7F2B00F	10	Intel® Management Engine Interface
0xF7F29000	0xF7F29FFF	1000	Intel® 82579LM Gigabit Network
0xF7F28000	0xF7F283FF	400	Intel® Chipset USB EHCI – 1C2D
0xF7F27000	0xF7F273FF	400	Intel® Chipset USB EHCI – 1C26
0xF7F26000	0xF7F267FF	800	Intel® Chipset 6 port SATA ACHI – 1C22
0xF7F25000	0xF7F250FF	100	Intel® Chipset SMBus Controller – 1C22
0xF7F20000	0xF7F23FFF	4000	High Definition Audio Controller
0xF7F00000	0xF7F1FFFF	20000	Intel® 82579LM Gigabit Network
0xF7E20000	0xF7E23FFF	4000	Intel® 82574L Gigabit Network #10
0xF7E00000	0xF7EFFFFF	100000	Intel® Chipset PCIe Root port 3 – 1C14 Intel® 82574L Gigabit Network #10
0xF7D20000	0xF7D23FFF	4000	Intel® 82574L Gigabit Network #9
0xF7D00000	0xF7DFFFFF	100000	Intel® Chipset PCIe Root port 4 – 1C16 Intel® 82574L Gigabit Network #9
0xF7C00000	0xF7CFFFFF	100000	Intel® Chipset PCIe Root port 6 – 1C1A LSI 1394 OHCI Compliant Host Controller
0xF7800000	0xF7BFFFFF	400000	Intel® HD Graphics Family
0xE0000000	0xEFFFFFFF	10000000	Intel® HD Graphics Family
0xDFA00000	0xDFA00FFF	1000	Motherboard resources PCI bus
0x40000000	0x401FFFFF	200000	System board
0x20000000	0x201FFFFF	200000	System board
0xE4000	0xE7FFF	4000	PCI bus
0xE0000	0xE3FFF	4000	PCI bus
0xDC000	0xDFFFF	4000	PCI bus
0xD8000	0xDBFFF	4000	PCI bus
0xD4000	0xD7FFF	4000	PCI bus
0xD0000	0xD3FFF	4000	PCI bus
0xA0000	0xBFFFF	20000	Intel® HD Graphics Family PCI bus

9.2 PCI Devices

Bus #	Device #	Function #	Vendor ID	Device ID	Chip	Device Function
0	0	0	8086	0104	CPU	Intel – DRAM Controller
0	2	0	8086	0126	CPU	Intel - VGA Controller
0	22	0	8086	1C3A	QM67 Chipset	Intel - Other communication
0	25	0	8086	1502	82579LM LAN	Intel - Ethernet Controller
0	26	0	8086	1C2D	QM67 Chipset	Intel - USB
0	27	0	8086	1C20	QM67 Chipset	Intel - HD Audio
0	28	0	8086	1C10	QM67 Chipset	Intel - PCI to PCI bridge 01
0	28	2	8086	1C14	QM67 Chipset	Intel - PCI to PCI bridge 02
0	28	3	8086	1C16	QM67 Chipset	Intel - PCI to PCI bridge 03
0	28	5	8086	1C1A	QM67 Chipset	Intel - PCI to PCI bridge 04
0	29	0	8086	1C26	QM67 Chipset	Intel - USB
0	31	0	8086	1C4F	QM67 Chipset	Intel - LPC
0	31	2	8086	1C03	QM67 Chipset	Intel - SATA Direct Port
0	31	3	8086	1C22	QM67 Chipset	Intel - SMBus
2	0	0	8086	10D3	82574L LAN	Intel - Ethernet Controller
3	0	0	8086	10D3	82574L LAN	Intel - Ethernet Controller
4	0	0	11C1	5903	LSI 1394 OHCI	LSI- IEEE1394

9.3 Interrupt Usage

IRQ	System timer	PS/2 Keyboard	COM2 Selection in BIOS	COM1 Selection in BIOS	COM4 Selection in BIOS	System CMOS/real-time watch	COM3 Selection in BIOS	Intel(R) SMBus -1C22	PS2 Mouse	Numerical Data Processor	Intel(R) USB EHCI – 1C2D	Intel(R) Management Engine Interface	LSI 1394 OHCI Host	Intel(R) SATA ACHI - 1C03	High Definition Audio	Intel(R) USB EHCI - 1C26							Notes
NMI																							
IRQ0	X																						
IRQ1		X																					
IRQ2																							
IRQ3			X																				
IRQ4				X																			
IRQ5																							
IRQ6																							
IRQ7					X																		
IRQ8						X																	
IRQ9																							
IRQ10							X																
IRQ11								X															
IRQ12									X														
IRQ13										X													
IRQ14																							
IRQ15																							
IRQ16											X	X											
IRQ17													X										
IRQ18																							
IRQ19														X									
IRQ20																							
IRQ21																							
IRQ22															X								
IRQ23																X							
IRQ24																							
IRQ25																							
IRQ26																							

9.4 IO Map

Address range (hex)		Size (hex)	Description
0x0000FFFF	0x0000FFFF	1	Motherboard resources
0x0000F0D0	0x0000F0D7	8	Intel® 6 port SATA AHCI – 1C03
0x0000F0C0	0x0000F0C3	4	Intel® 6 port SATA AHCI – 1C03
0x0000F0B0	0x0000F0B7	8	Intel® 6 port SATA AHCI – 1C03
0x0000F0A0	0x0000F0A3	4	Intel® 6 port SATA AHCI – 1C03
0x0000F060	0x0000F07F	20	Intel® 6 port SATA AHCI – 1C03
0x0000F040	0x0000F05F	20	Intel® SMBus – 1C22
0x0000F000	0x0000F03F	40	Intel® HD Graphics family
0x0000E000	0x0000EFFF	1000	Intel® PCIe Root port 3 – 1C14
0x0000D000	0x0000DFFF	1000	Intel® PCIe Root port 4 – 1C16
0x0000164E	0x0000164F	2	Motherboard resources
0x00000F78	0x00000F7F	8	Motherboard resources
0x00000D00	0x0000FFFF	F300	PCI bus
0x00000B78	0x00000B7F	8	Motherboard resources
0x00000A00	0x00000A2F	30	Motherboard resources
0x00000778	0x0000077F	8	Motherboard resources
0x00000680	0x0000069F	20	Motherboard resources
0x00000500	0x0000057F	80	Motherboard resources
0x000004D0	0x000004D1	2	Programmable interrupt controller Motherboard resources
0x00000458	0x0000047F	28	Motherboard resources
0x00000454	0x00000457	4	Motherboard resources
0x00000400	0x00000453	54	Motherboard resources
0x000003F8	0x000003FF	8	COM1
0x000003E8	0x000003EF	8	COM4
0x000003C0	0x000003DF	20	Intel® HD Graphics family
0x000003B0	0x000003BB	C	Intel® HD Graphics family
0x00000378	0x0000037F	8	Printer port LPT1
0x000002F8	0x000002FF	8	COM2
0x000002E8	0x000002EF	8	COM3
0x00000290	0x0000029F	10	Motherboard resources
0x0000020E	0x0000020F	2	Motherboard resources
0x000000F0	0x000000FF	10	Numeric data processor
0x000000E0	0x000000EF	10	Motherboard resources
0x000000D0	0x000000DF	10	Direct memory access controller
0x000000BE	0x000000BF	2	Motherboard resources
0x000000BC	0x000000BD	2	Programmable interrupt controller
0x000000BA	0x000000BB	2	Motherboard resources
0x000000B8	0x000000B9	2	Programmable interrupt controller
0x000000B6	0x000000B7	2	Motherboard resources
0x000000B4	0x000000B5	2	Programmable interrupt controller
0x000000B2	0x000000B3	2	Motherboard resources
0x000000B0	0x000000B1	2	Programmable interrupt controller
0x000000AE	0x000000AF	2	Motherboard resources
0x000000AC	0x000000AD	2	Programmable interrupt controller
0x000000AA	0x000000AB	2	Motherboard resources
0x000000A8	0x000000A9	2	Programmable interrupt controller
0x000000A6	0x000000A7	2	Motherboard resources
0x000000A4	0x000000A5	2	Programmable interrupt controller
0x000000A2	0x000000A3	2	Motherboard resources
0x000000A0	0x000000A1	2	Programmable interrupt controller

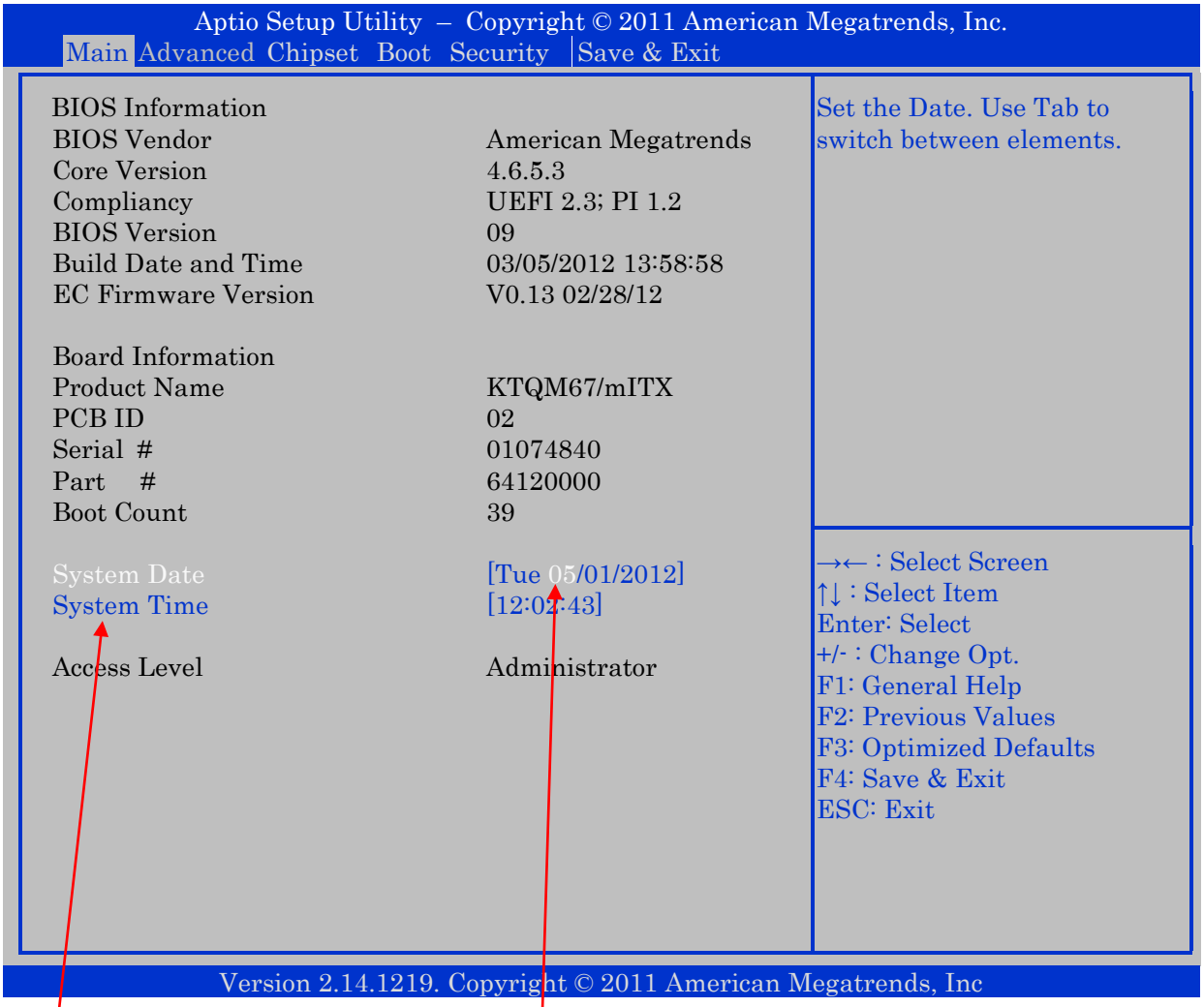
Address range (hex)		Size (hex)	Description
0x00000093	0x0000009F	D	Direct memory access controller
0x00000092	0x00000092	1	Motherboard resources
0x00000081	0x00000091	10	Direct memory access controller
0x00000072	0x00000080	E	Motherboard resources
0x00000070	0x00000070	1	System CMOS/real time clock
0x00000067	0x00000067	1	Motherboard resources
0x00000065	0x00000065	1	Motherboard resources
0x00000064	0x00000064	1	Standard PS/2 Keyboard
0x00000063	0x00000063	1	Motherboard resources
0x00000061	0x00000061	1	Motherboard resources
0x00000060	0x00000060	1	Standard PS/2 Keyboard
0x00000054	0x0000005F	C	Motherboard resources
0x00000050	0x00000053	4	System Timer
0x0000004E	0x0000004F	2	Motherboard resources
0x00000044	0x0000004D	A	Motherboard resources
0x00000040	0x00000043	4	System Timer
0x0000003E	0x0000003F	2	Motherboard resources
0x0000003C	0x0000003D	2	Programmable interrupt controller
0x0000003A	0x0000003B	2	Motherboard resources
0x00000038	0x00000039	2	Programmable interrupt controller
0x00000036	0x00000037	2	Motherboard resources
0x00000034	0x00000035	2	Programmable interrupt controller
0x00000032	0x00000033	2	Motherboard resources
0x00000030	0x00000031	2	Programmable interrupt controller
0x0000002E	0x0000002F	2	Motherboard resources
0x0000002C	0x0000002D	2	Programmable interrupt controller
0x0000002A	0x0000002B	2	Motherboard resources
0x00000028	0x00000029	2	Programmable interrupt controller
0x00000026	0x00000027	2	Motherboard resources
0x00000024	0x00000025	2	Programmable interrupt controller
0x00000022	0x00000023	2	Motherboard resources
0x00000020	0x00000021	2	Programmable interrupt controller
0x00000010	0x0000001F	10	Motherboard resources
0x00000000	0x0000001F	20	Direct memory access controller PCI bus

10 BIOS

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

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

10.1 Main

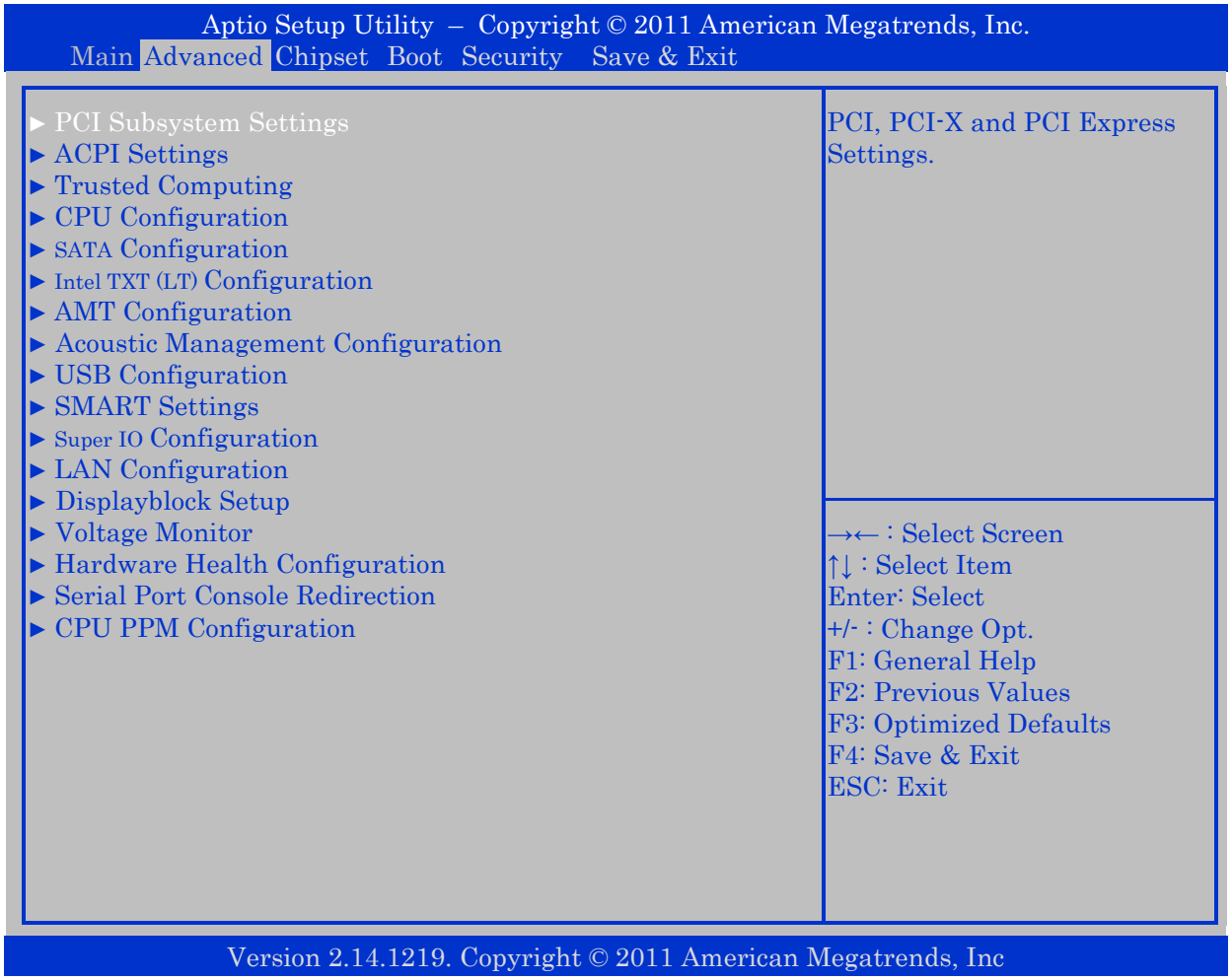


Blue text for settings that can be changed. White text for actual setting to be changed via the control keys (Black text for settings that cannot be changed via control keys)

The following table describes the changeable settings:

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

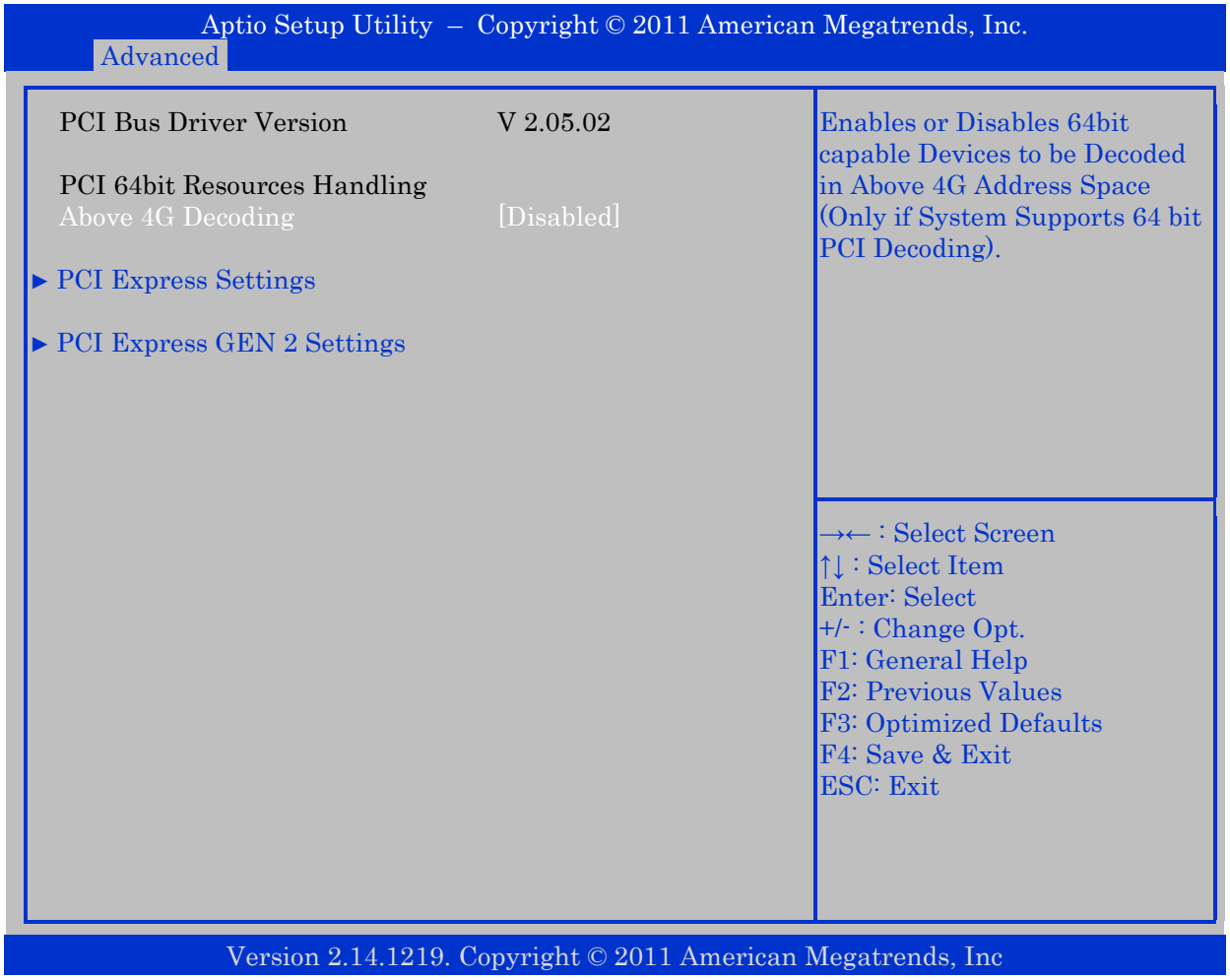
10.2 Advanced



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

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

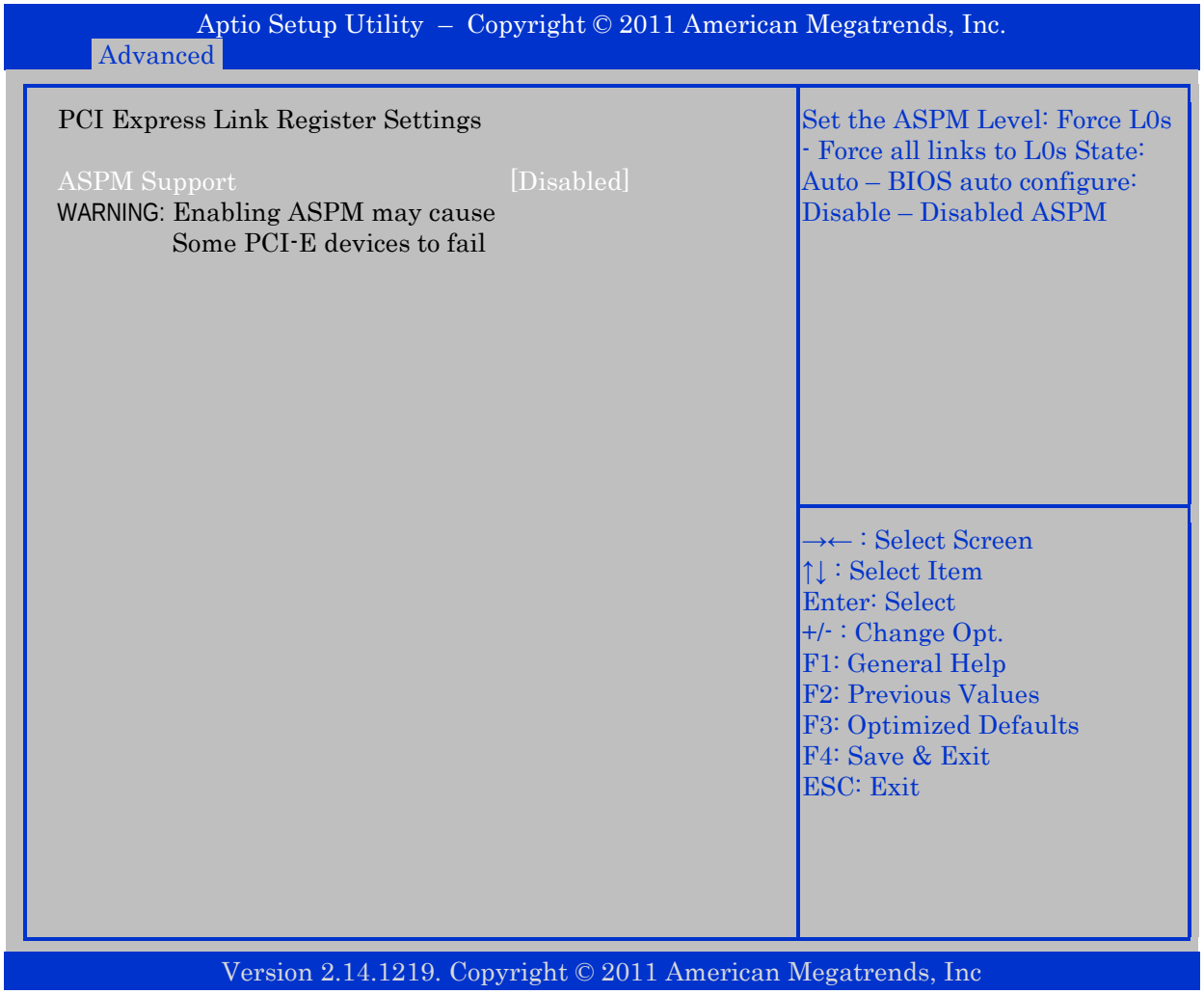
10.2.1 Advanced - PCI Subsystem Settings



Function	Selection	Description
Above 4G Decoding	**Disabled** Enabled	Enables or Disables 64bit capable Devices to be Decoded in Above 4G Address Space (Only if System Supports 64 bit PCI Decoding).

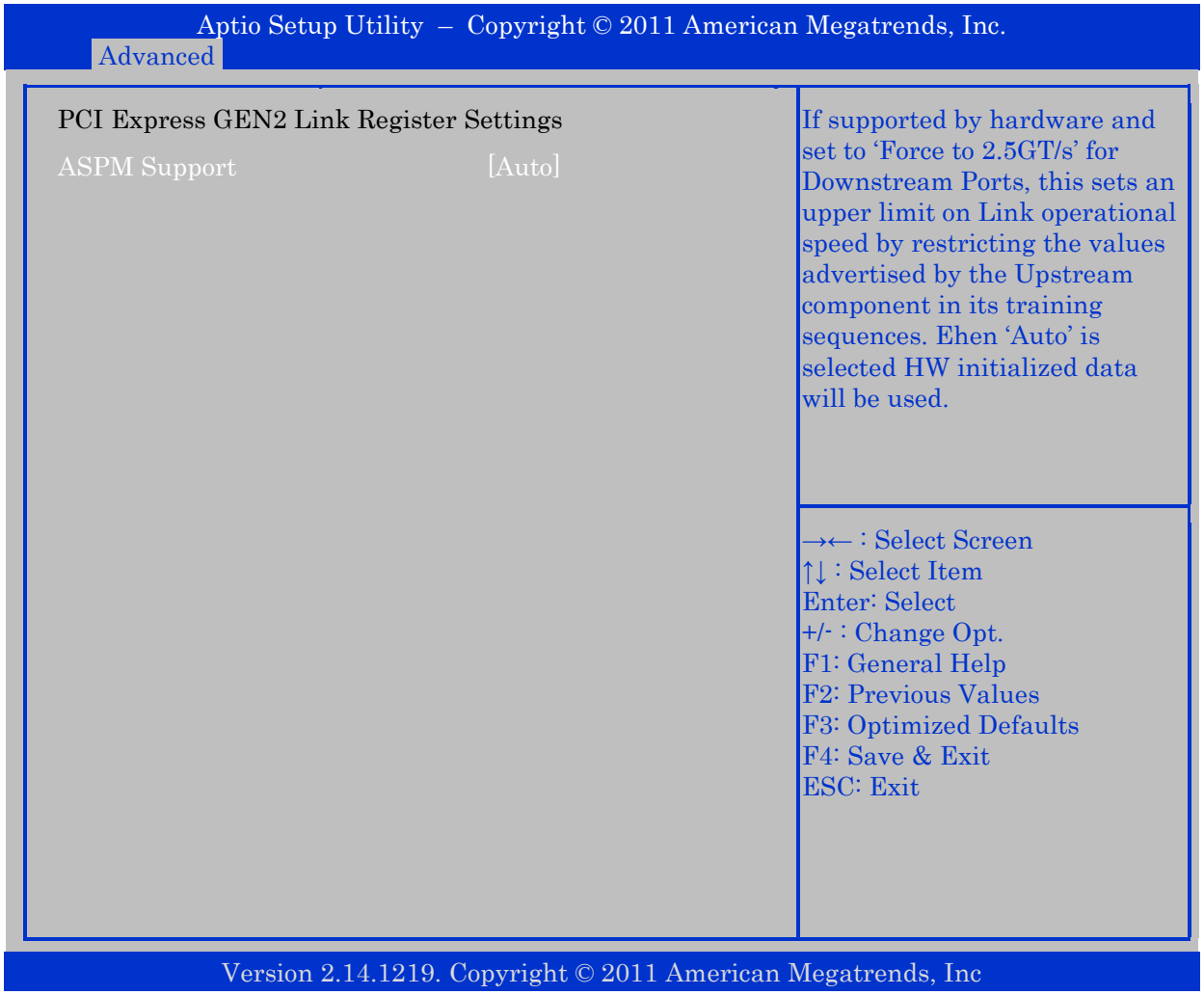
Note: The selection in **bold** is the default selection.

10.2.1.1 PCI Express Settings



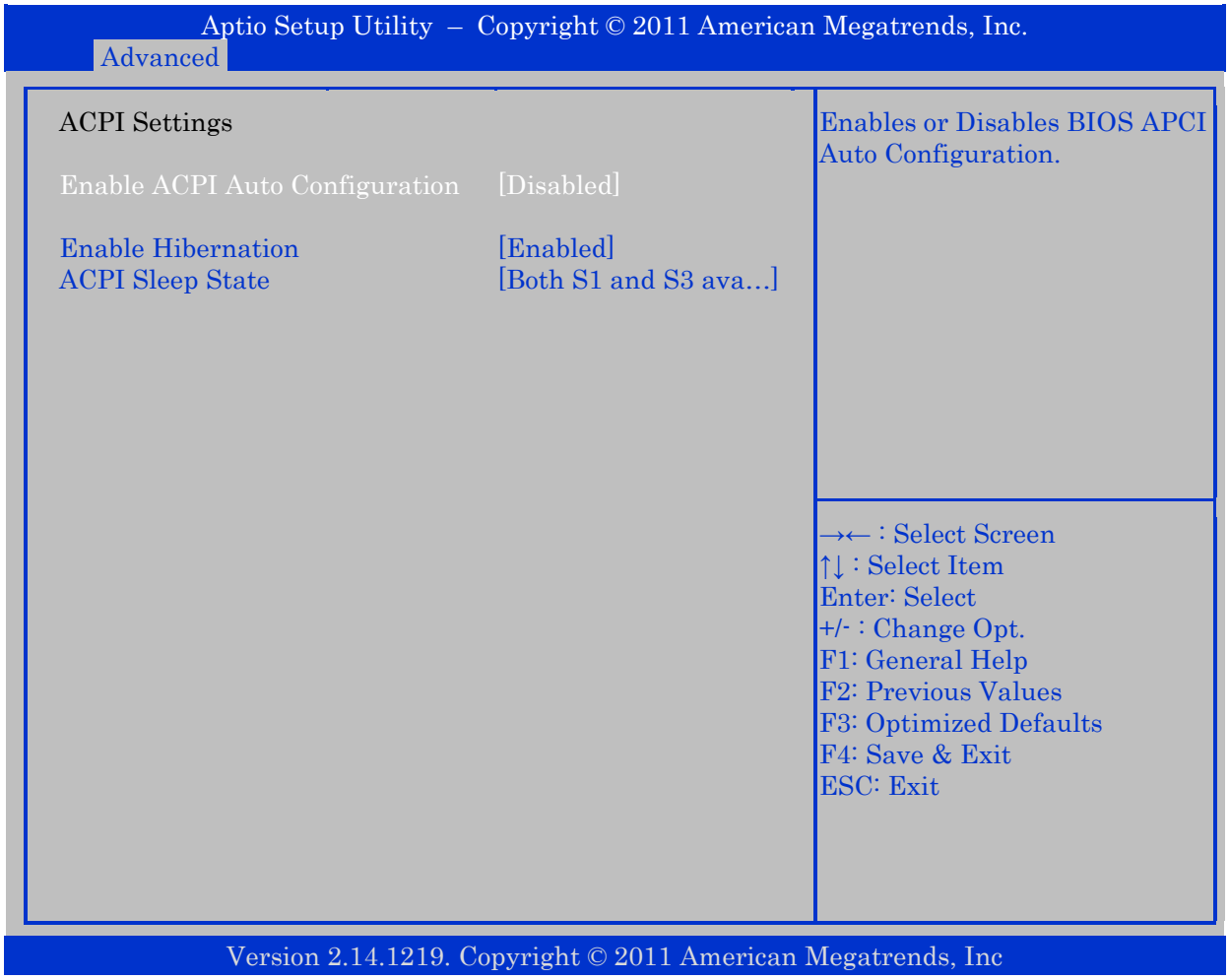
Function	Selection	Description
ASPM Support	**Disabled** Auto Force L0s	Set the ASPM Level: Force L0s - Force all links to L0s State: Auto – BIOS auto configure: Disable – Disabled ASPM

10.2.1.2 PCI Express GEN 2 Settings



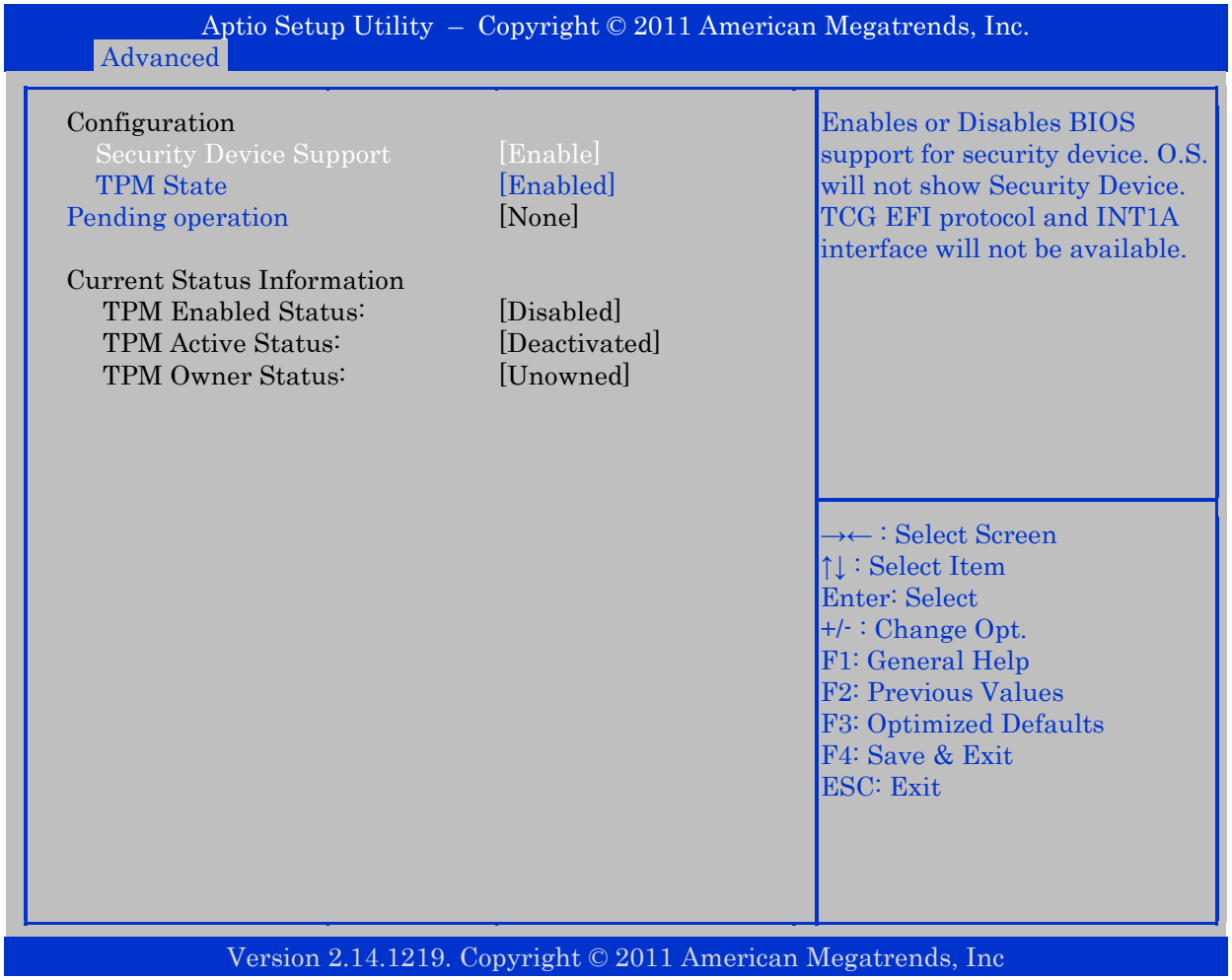
Function	Selection	Description
Target Link Speed	**Auto** Force to 2.5GT/s Force to 5.0GT/s	If supported by hardware and set to 'Force to 2.5GT/s' for Downstream Ports, this sets an upper limit on Link operational speed by restricting the values advertised by the Upstream component in its training sequences. Ehen 'Auto' is selected HW initialized data will be used.

10.2.2 Advanced - APCI Settings



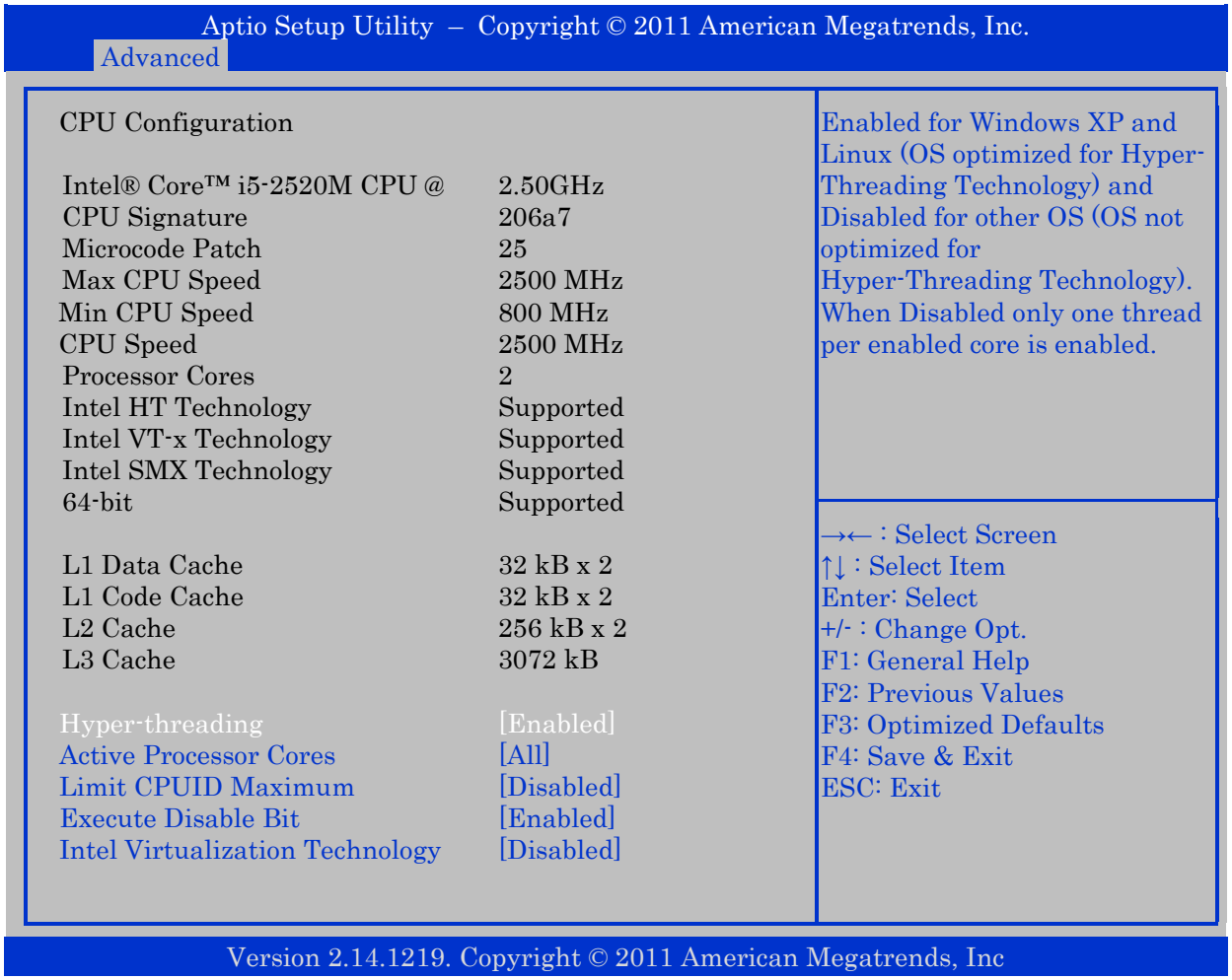
Function	Selection	Description
Enable ACPI Auto Configuration	**Disabled** Enabled	Enables or Disables BIOS APCI Auto Configuration.
Enable Hibernation	Disabled **Enabled**	Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS.
ACPI Sleep State	Suspend Disabled S1 only(CPU Stop Clock) S3 only(Suspend to RAM) **Both S1 and S3 available** **For OS to choose from**	Select ACPI sleep state the system will enter when the SUSPEND button is pressed.

10.2.3 Advanced - Trusted Computing



Function	Selection	Description
Security Device Support	**Disabled** Enabled	Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.
TPM State	**Disabled** Enabled	Enable/Disable Security Device. NOTE: Your Computer will reboot during restart in order to change State of the Device.
Pending operation	**None** Enable Take Ownership Disable Take Ownership TPM Clear	Schedule an Operation for the Security Device. NOTE: Your Computer will reboot during restart in order to change State of the Device.

10.2.4 Advanced - CPU Configuration



Function	Selection	Description
Hyper-threading	Disabled **Enabled**	Enabled for Windows XP and Linux (OS optimized for Hyper-Threading Technology) and Disabled for other OS (OS not optimized for Hyper-Threading Technology). When Disabled only one thread per enabled core is enabled.
Active Processor Cores	**All** 1	Number of cores to enable in each processor package.
Limit CPUID Maximum	Disabled **Enabled**	Disabled for Windows XP
Execute Disable Bit	Disabled **Enabled**	XD can prevent certain classes of malicious buffer overflow attacks when combined with supporting OS (Windows Server 2003 SP1, Windows XP SP2, SuSE Linux 9.2, RedHat Enterprise 3 Update 3.)
Intel Virtualization Technology	**Disabled** Enabled	When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.

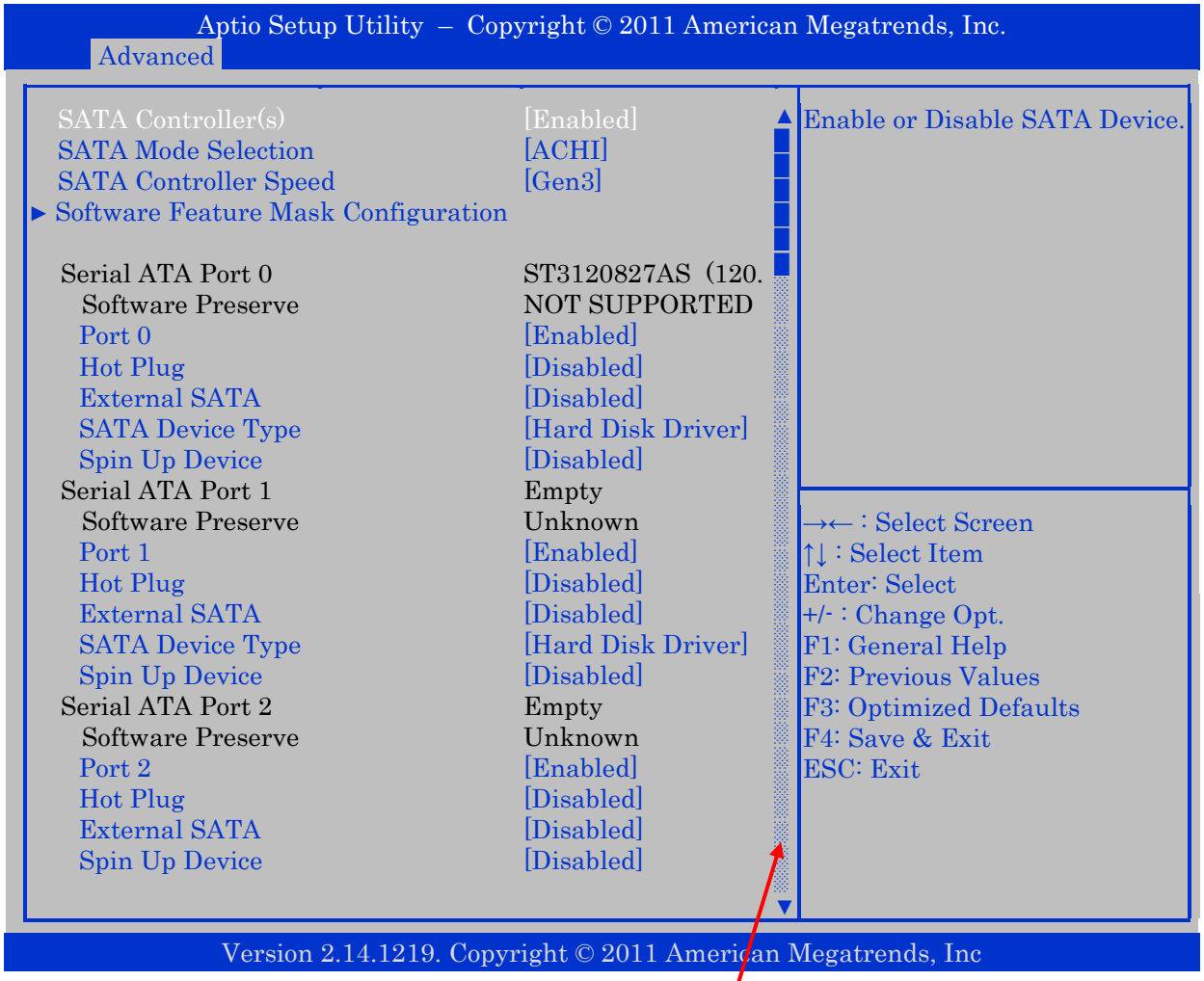
Notes:

Intel HT Technology (Hyper Threading Technology) is a performance feature which allows one core on the processor to appear like 2 cores to the operating system. This doubles the execution resources available to the O/S, which potentially increases the performance of your overall system.

Intel VT-x Technology (Virtualization Technology) Previously codenamed "Vanderpool", VT-x represents Intel's technology for virtualization on the x86 platform. In order to support “Virtualization Technology” the CPU must support VT-x and the BIOS setting “Intel Virtualization Technology” must be enabled.

Intel SMX Technology (Safer Mode Extensions Technology) is a part of the Trusted Execution Technology.

10.2.5 Advanced - SATA Configuration

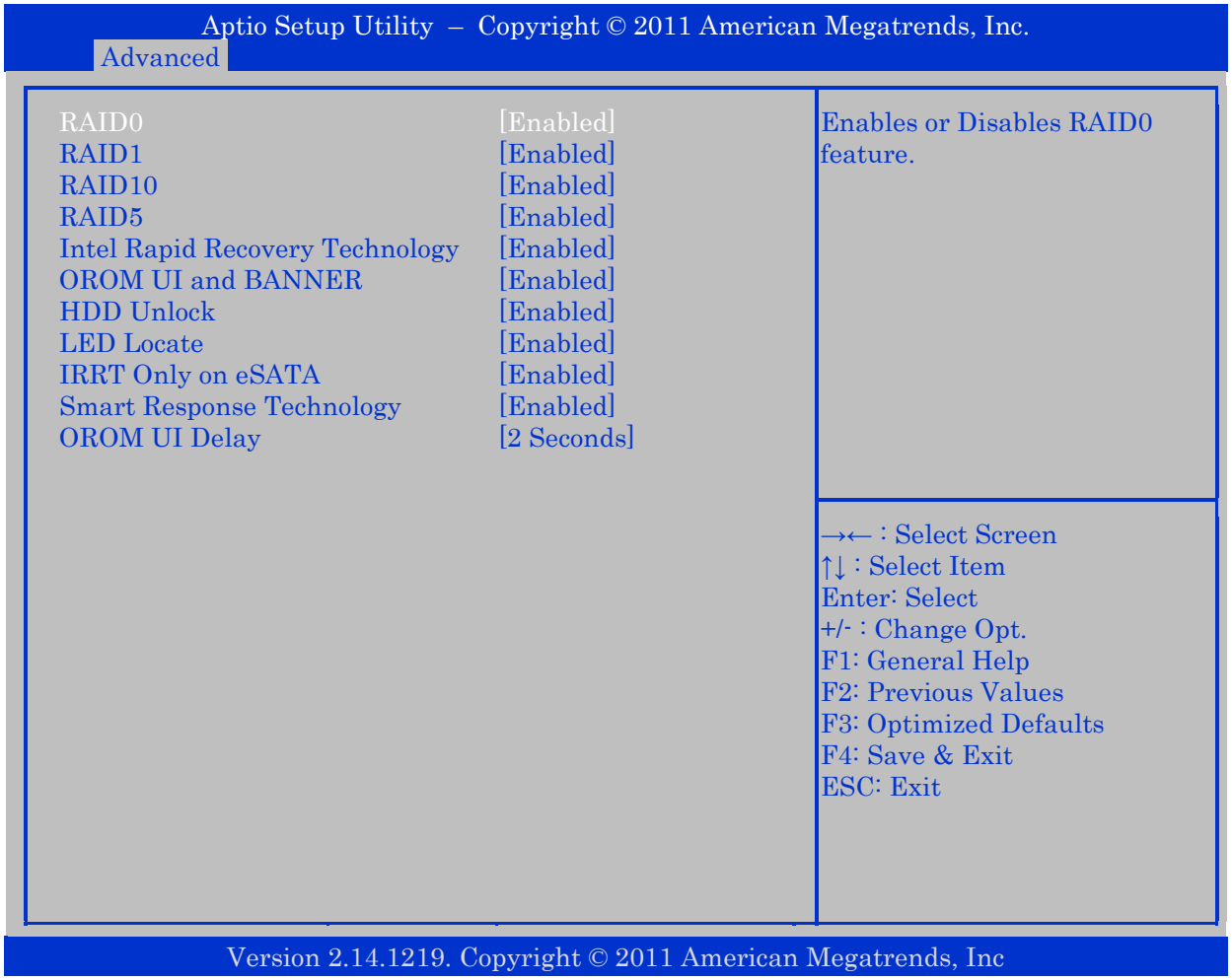


Note: By scrolling down (or up) also settings for Serial ATA Port 3 - 5 can be accessed.

Function	Selection	Description
SATA Controller(s)	Disabled **Enabled**	Enable or Disable SATA Device.
SATA Mode Selection	IDE **ACHI** RAID	Determines how SATA controller(s) operate.
SATA Controller Speed	Gen1 Gen2 **Gen3**	Indicates the maximum speed the SATA controller can support.

Note: in the above BIOS menu the functions below the submenu *Software Feature Mask Configuration* will be described after the submenu description.

10.2.5.1 Software Feature Mask Configuration



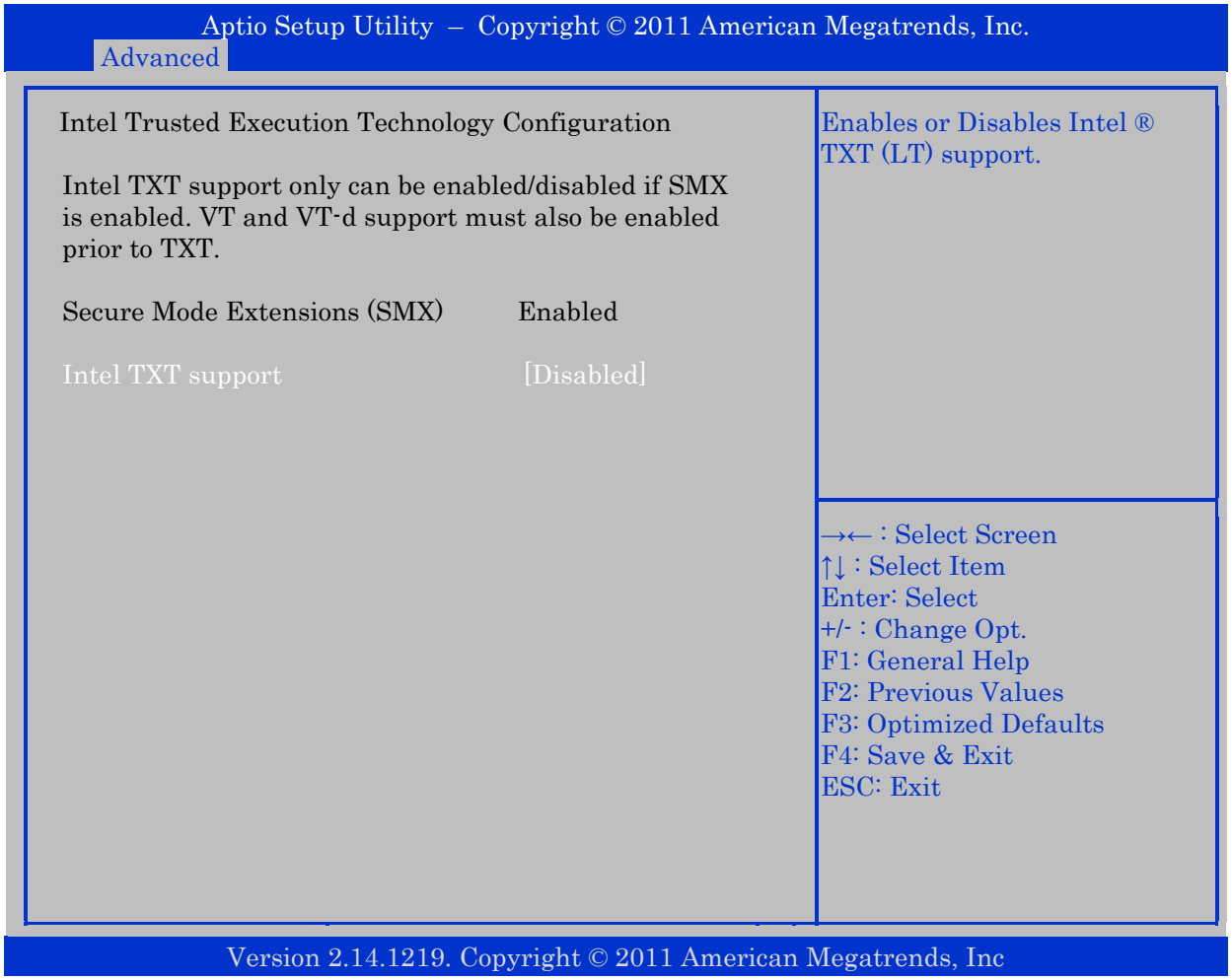
Submenu *Software Feature Mask Configuration* description:

Function	Selection	Description
RAID0	Disabled **Enabled**	Enable or disable RAID0 feature.
RAID1	Disabled **Enabled**	Enable or disable RAID1 feature.
RAID10	Disabled **Enabled**	Enable or disable RAID10 feature.
RAID5	Disabled **Enabled**	Enable or disable RAID5 feature.
Intel Rapid Recovery Technology	Disabled **Enabled**	Enable or disable Intel Rapid Recovery Technology.
OROM UI and BANNER	Disabled **Enabled**	If enabled, then the OROM UI is shown. Otherwise, no OROM banner or information will be displayed if all disks and RAID volumes are Normal.
HDD Unlock	Disabled **Enabled**	If enabled, indicates that the HDD password unlock in the OS is enabled.
LED Locate	Disabled **Enabled**	If enabled, indicates that the LED/SGPIO hardware is attached and ping to locate feature is enabled on the OS.
IRRT Only on eSATA	Disabled **Enabled**	If enabled, then only IRRT volumes can span internal and eSATA drives. If disabled, then any RAID volume can span internal and eSATA drives.
Smart Response Technology	Disabled **Enabled**	Enable or disable Smart Response Technology
OROM UI Delay	**2 Seconds** 4 Seconds 6 Seconds 8 Seconds	If enabled, indicates the delay of the OROM UI Splash Screen in normal status.

Remaining *SATA Configuration* menu description:

Function	Selection	Description
Port 0	Disabled **Enabled**	Enable or Disable SATA Port.
Hot Plug	**Disabled** Enabled	Designates this port as Hot Pluggable.
External SATA	**Disabled** Enabled	External SATA Support.
SATA Device Type	**Hard Disk Drive** Solid State Drive	Identify the SATA port is connected to Solid State Drive or Hard Disk Drive.
Spin Up Device	**Disabled** Enabled	On an edge detect from 0 to 1, the PCH starts a COMRESET initialization sequence to the device.
Port 1	Disabled **Enabled**	Enable or Disable SATA Port.
Hot Plug	(see same function above)	(see same function above)
External SATA	(see same function above)	(see same function above)
SATA Device Type	(see same function above)	(see same function above)
Spin Up Device	(see same function above)	(see same function above)
Port 2	Disabled **Enabled**	Enable or Disable SATA Port.
Hot Plug	(see same function above)	(see same function above)
External SATA	(see same function above)	(see same function above)
Spin Up Device	(see same function above)	(see same function above)
Port 3	Disabled **Enabled**	Enable or Disable SATA Port.
Hot Plug	(see same function above)	(see same function above)
External SATA	(see same function above)	(see same function above)
Spin Up Device	(see same function above)	(see same function above)
Port4	Disabled **Enabled**	Enable or Disable SATA Port.
Hot Plug	(see same function above)	(see same function above)
External SATA	(see same function above)	(see same function above)
Spin Up Device	(see same function above)	(see same function above)
Port5	Disabled **Enabled**	Enable or Disable SATA Port.
Hot Plug	(see same function above)	(see same function above)
External SATA	(see same function above)	(see same function above)
Spin Up Device	(see same function above)	(see same function above)

10.2.6 Advanced - Intel TXT (LT) Configuration



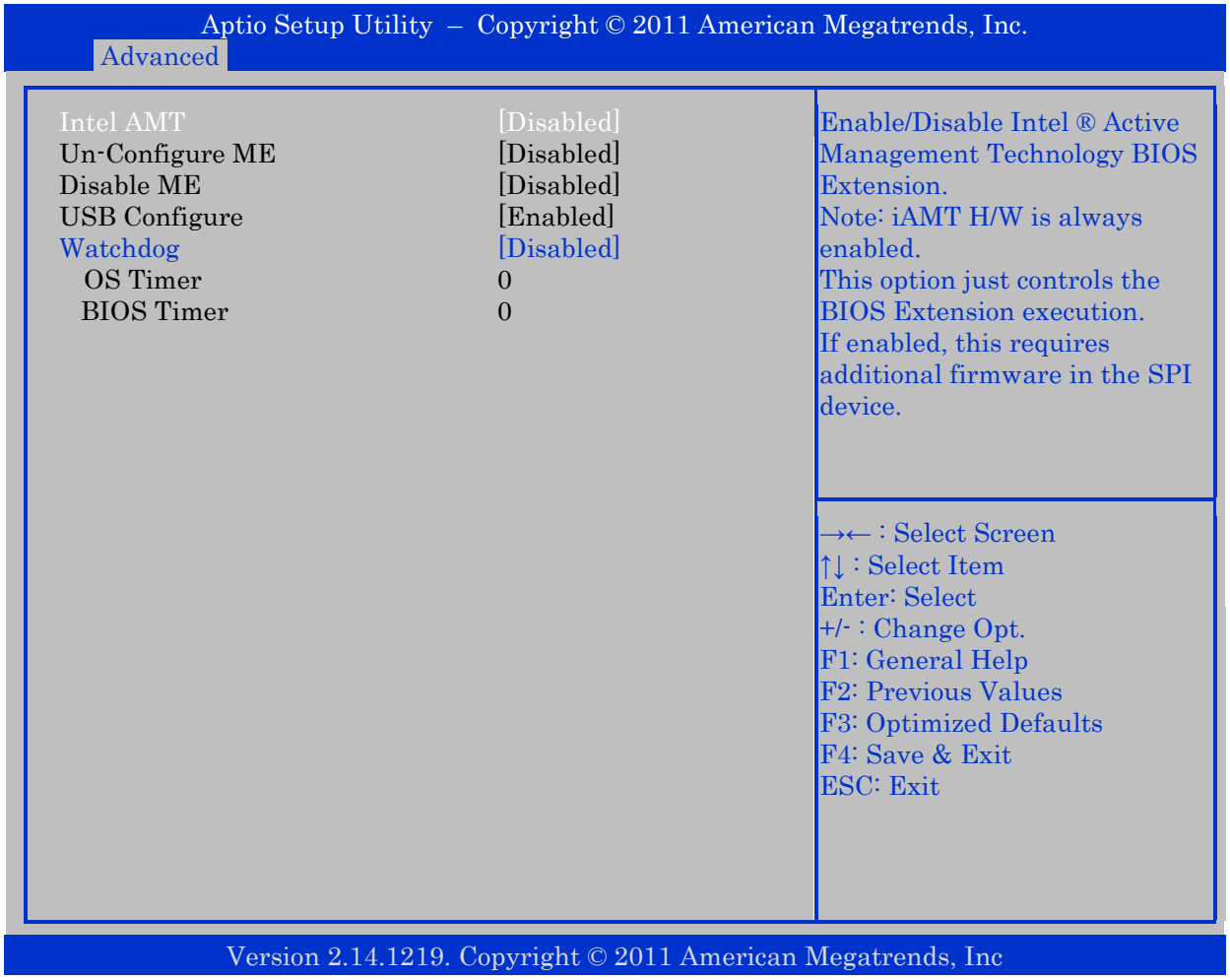
SMX (Intel Secure Mode Extension) instructions are enabled if supported by the CPU, so no BIOS settings is present.

VT (Intel Virtualization Technology) is enabled/disabled in the menu: *Advanced > CPU Configuration*.

VT-d can be enabled/disabled in the menu: *Chipset > System Agent (SA) Configuration.*

Function	Selection	Description
Intel TXT support	**Disabled** Enabled	Enables or Disables Intel ® TXT (LT) support.

10.2.7 Advanced - AMT Configuration



Function	Selection	Description
Intel AMT	**Disabled** Enabled	Enable/Disable Intel ® Active Management Technology BIOS Extension. Note: iAMT H/W is always enabled. This option just controls the BIOS Extension execution. If enabled, this requires additional firmware in the SPI device.
Un-Configure ME (Note1)	**Disabled** Enabled	OEMFlag Bit 15: Un-Configure ME without password.
Disable ME (Note1)	**Disabled** Enabled	Set ME to Soft Temporary Disabled.
USB Configure (Note1)	Disabled **Enabled**	Enable/Disable USB Configure function.
Watchdog (Note2)	**Disabled** Enabled	Enable/Disable Watchdog Timer.
OS Timer (Note3)	0 - 65535 (Note4)	Set OS watchdog timer.
BIOS Timer (Note3)	0 - 65535 (Note4)	Set BIOS Watchdog Timer.

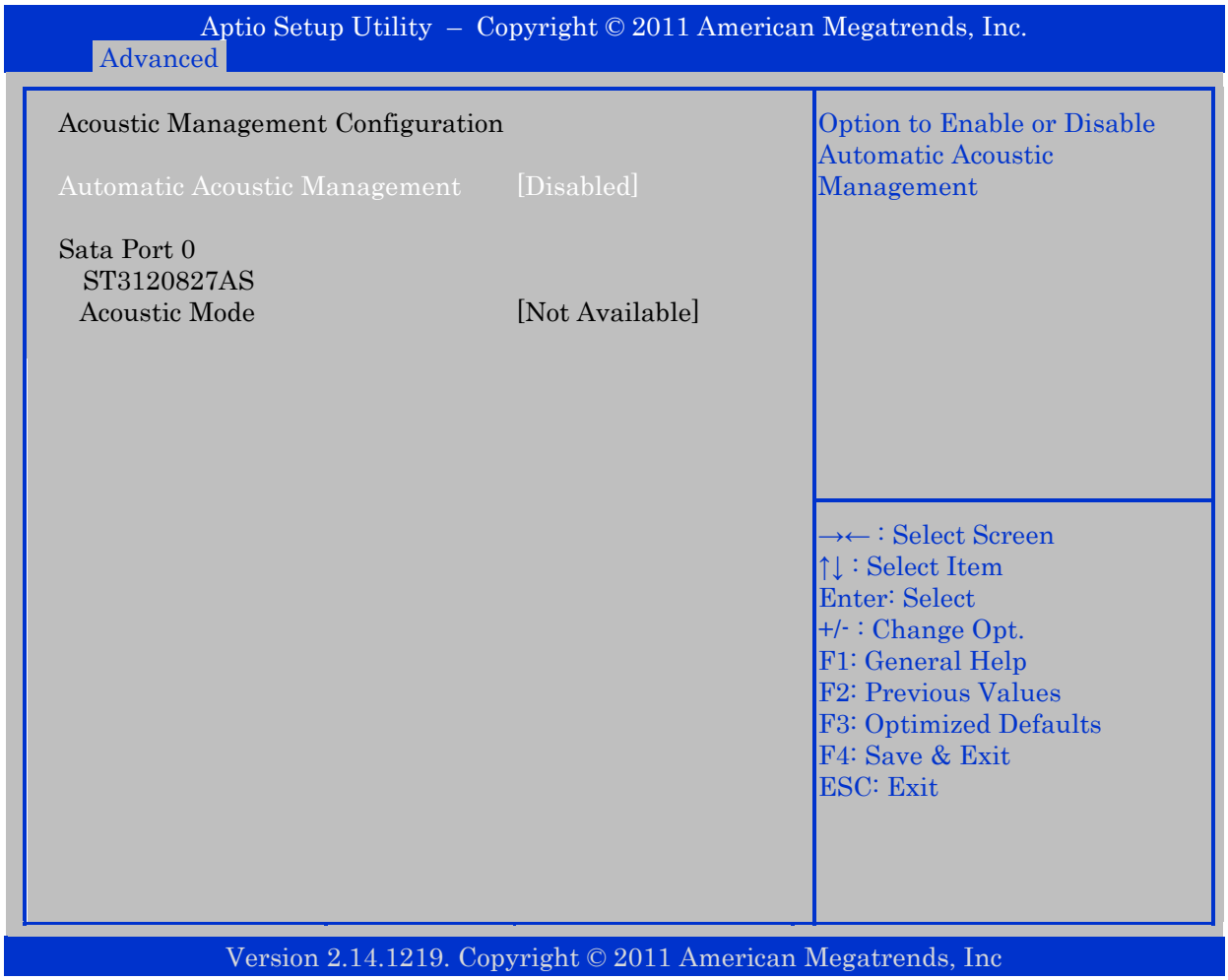
Note1: Only if Intel AMT = Enabled.

Note2: This Watchdog function is unsupported.
Recommendation, use Watchdog function present in *Hardware Health Configuration* menu.

Note3: Only if Watchdog = Enabled.

Note4: To enter number use digit keys and/or +/- keys.

10.2.8 Advanced - Acoustic Management Configuration



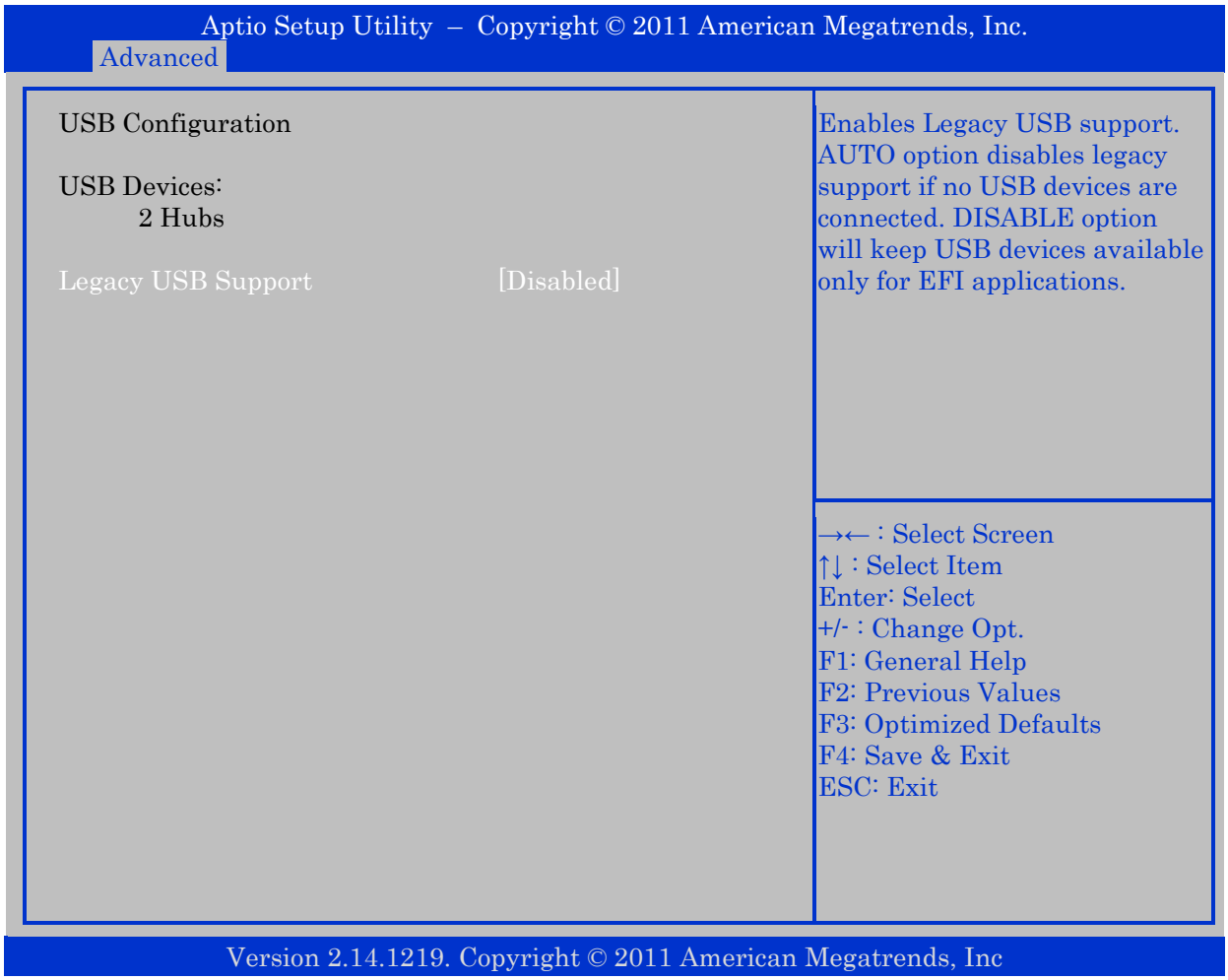
Function	Selection	Description
Automatic Acoustic Management	Enabled **Disabled**	Option to Enable or Disable Automatic Acoustic Management.

Note:

Automatic acoustic management (AAM) is a method for reducing acoustic emanations in AT Attachment (ATA) mass storage devices, such as ATA hard disk drives and ATAPI optical disc drives. AAM is an optional feature set for ATA/ATAPI devices; when a device supports AAM, the acoustic management parameters are adjustable through a software or firmware user interface.

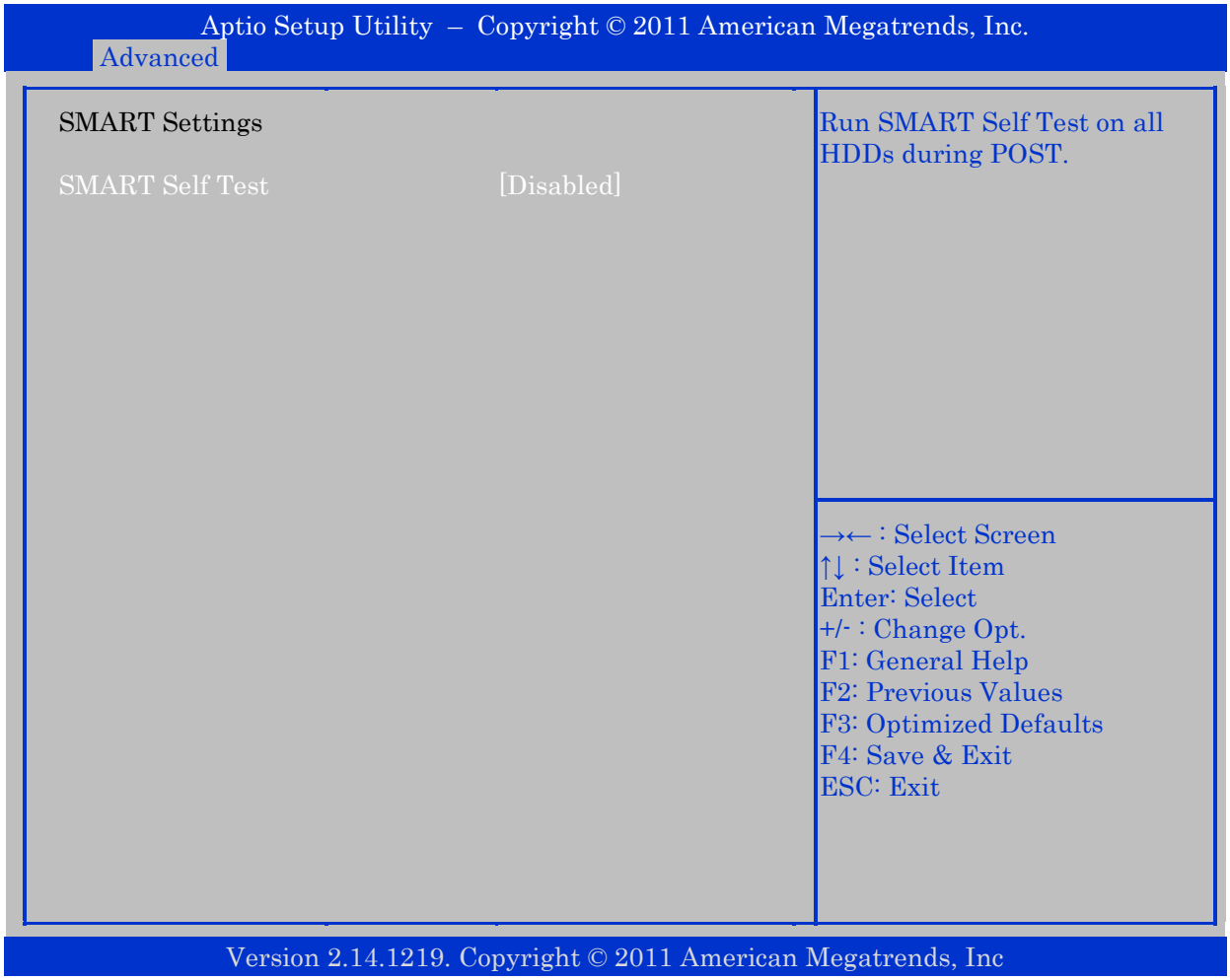
The ATA/ATAPI sub-command for setting the level of AAM operation is an 8-bit value from 0 to 255. Most modern drives ship with the vendor-defined value of 0x00 in the acoustic management setting. This often translates to the max-performance value of 254 stated in the standard. Values between 128 and 254 (0x80 - 0xFE) enable the feature and select most-quiet to most-performance settings along that range. Though hard drive manufacturers may support the whole range of values, the settings are allowed to be banded so many values could provide the same acoustic performance.

10.2.9 Advanced - USB Configuration



Function	Selection	Description
Legacy USB Support	Enabled **Disabled** Auto	Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications.

10.2.10 Advanced - SMART Settings

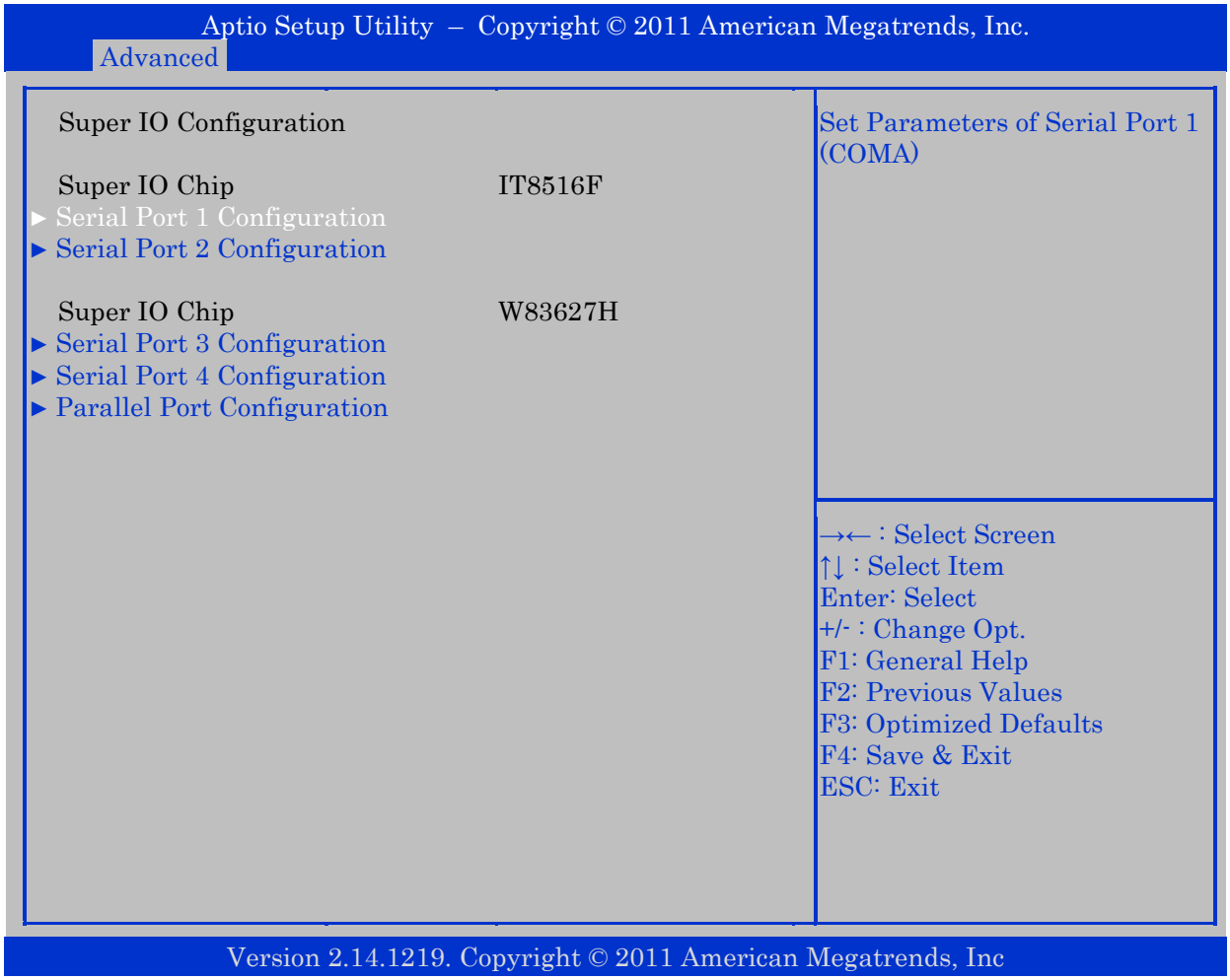


Function	Selection	Description
SMART Self Test	**Disabled** Enabled	Run SMART Self Test on all HDDs during POST.

Note:

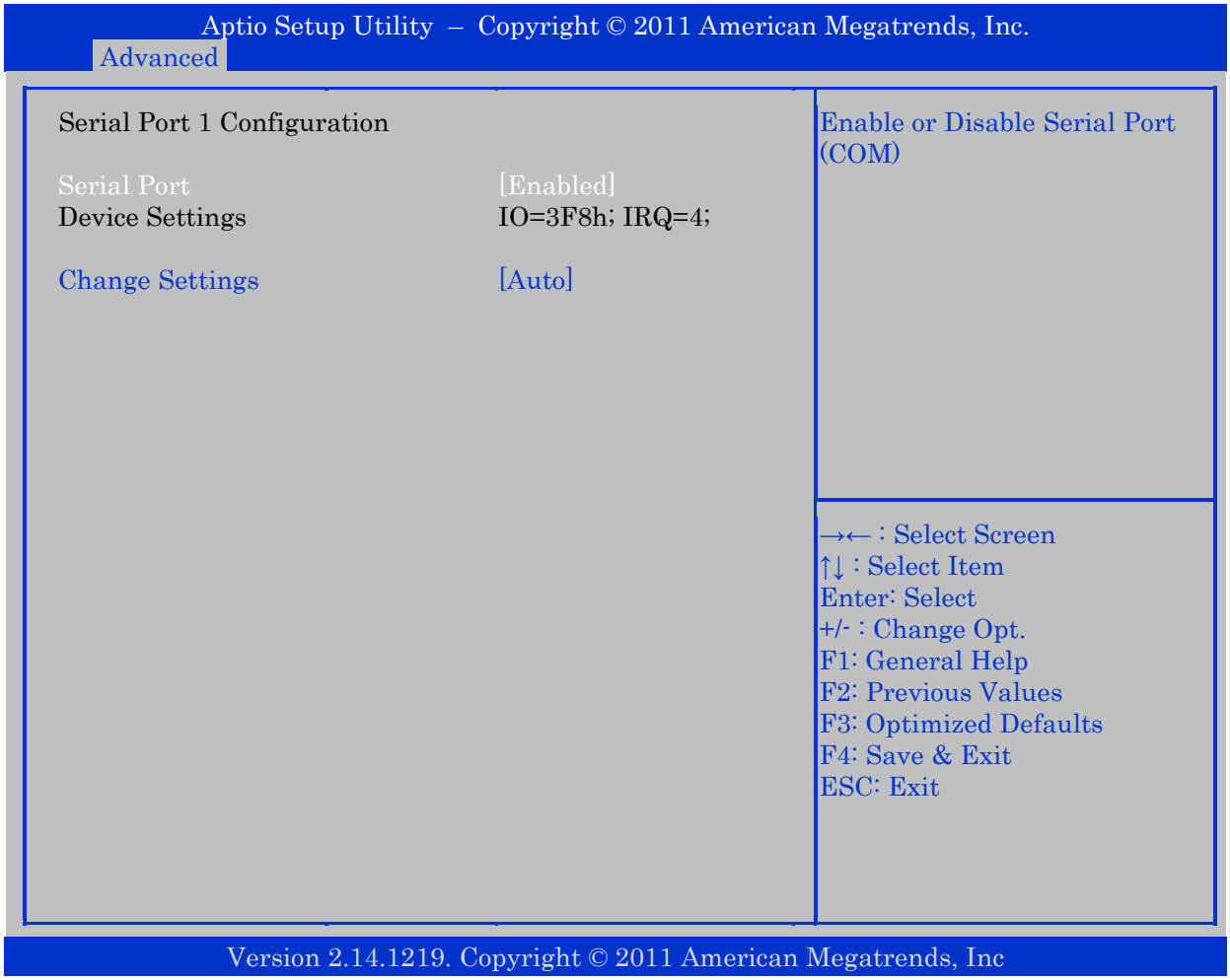
S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology; often written as SMART) is a monitoring system for computer hard disk drives to detect and report on various indicators of reliability, in the hope of anticipating failures.

10.2.11 Advanced - Super IO Configuration



The 5 submenus are shown and described on the following pages.

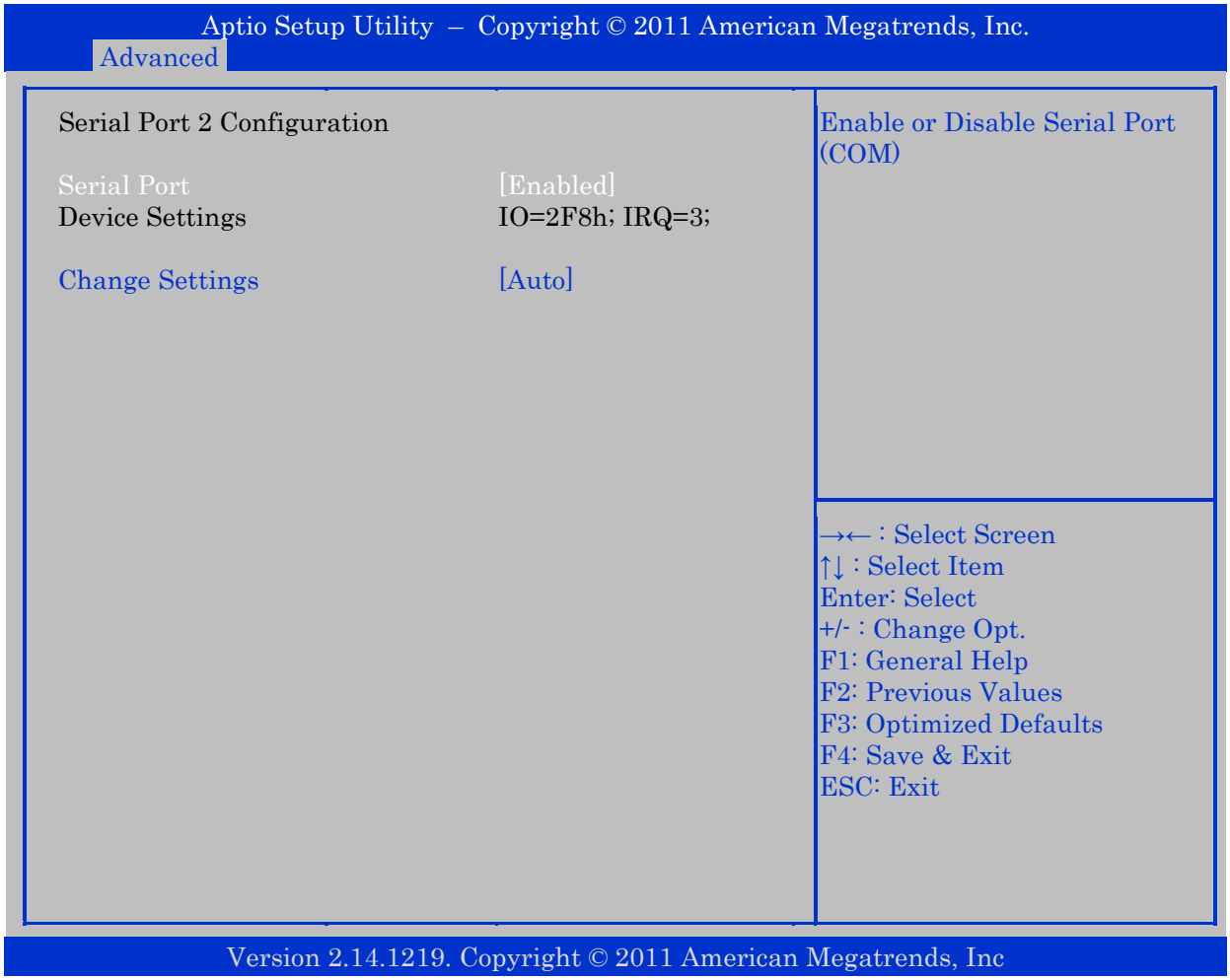
10.2.11.1 Serial Port 1 Configuration



Function	Selection	Description
Serial Port	Disabled **Enabled**	Enable or Disable Serial Port (COM)
Change Settings Note1	**Auto** IO=3F8h; IRQ=4; IO=3F8h; IRQ=3,4,5,6,7,10,11,12; IO=2F8h; IRQ=3,4,5,6,7,10,11,12; IO=3E8h; IRQ=3,4,5,6,7,10,11,12; IO=2E8h; IRQ=3,4,5,6,7,10,11,12;	Select an optimal setting for Super IO device.

Note1: only if Serial Port = Enabled

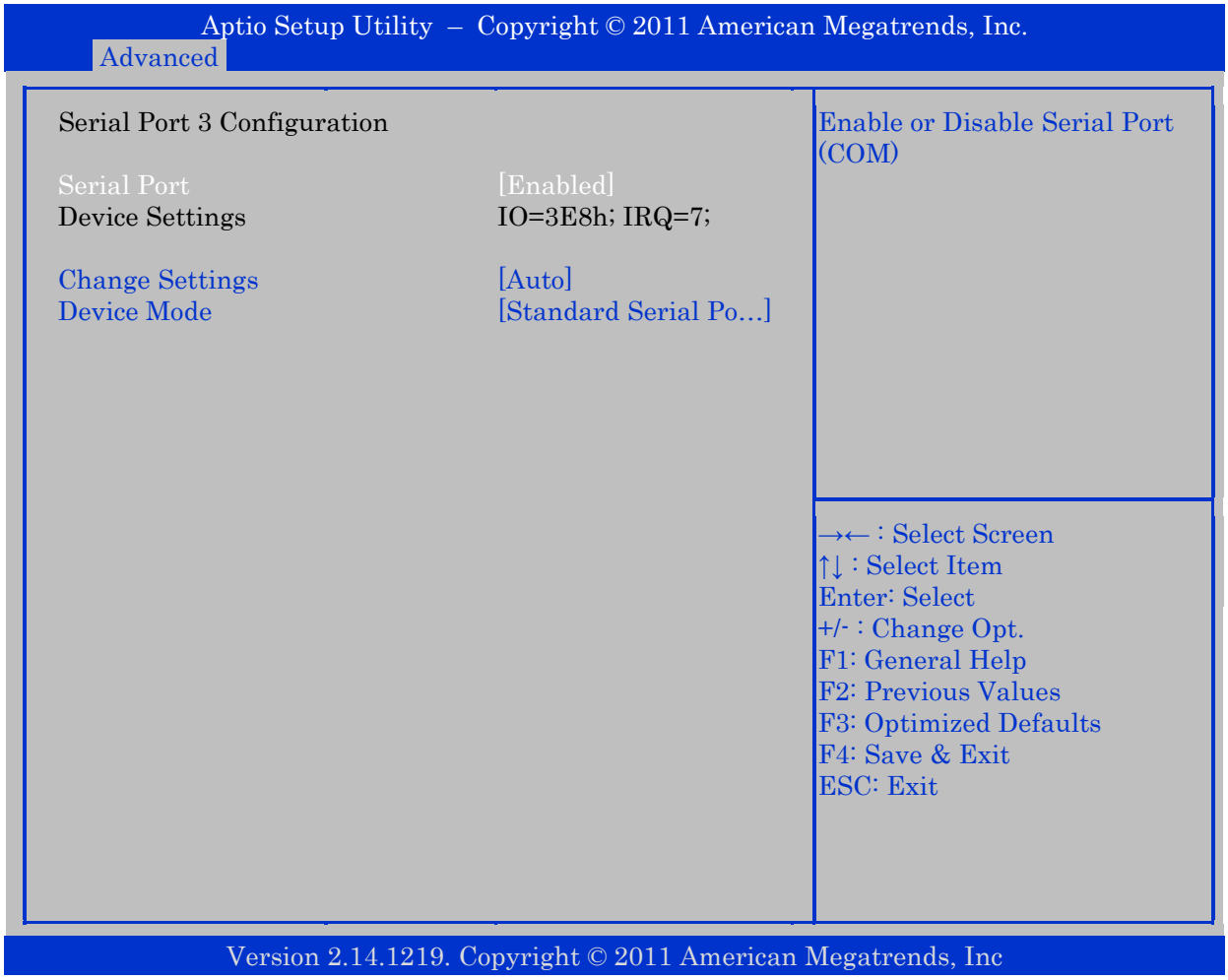
10.2.11.2 Serial Port 2 Configuration



Function	Selection	Description
Serial Port	Disabled **Enabled**	Enable or Disable Serial Port (COM)
Change Settings Note1	**Auto** IO=2F8h; IRQ=3; IO=3F8h; IRQ=3,4,5,6,7,10,11,12; IO=2F8h; IRQ=3,4,5,6,7,10,11,12; IO=3E8h; IRQ=3,4,5,6,7,10,11,12; IO=2E8h; IRQ=3,4,5,6,7,10,11,12;	Select an optimal setting for Super IO device.

Note1: only if Serial Port = Enabled

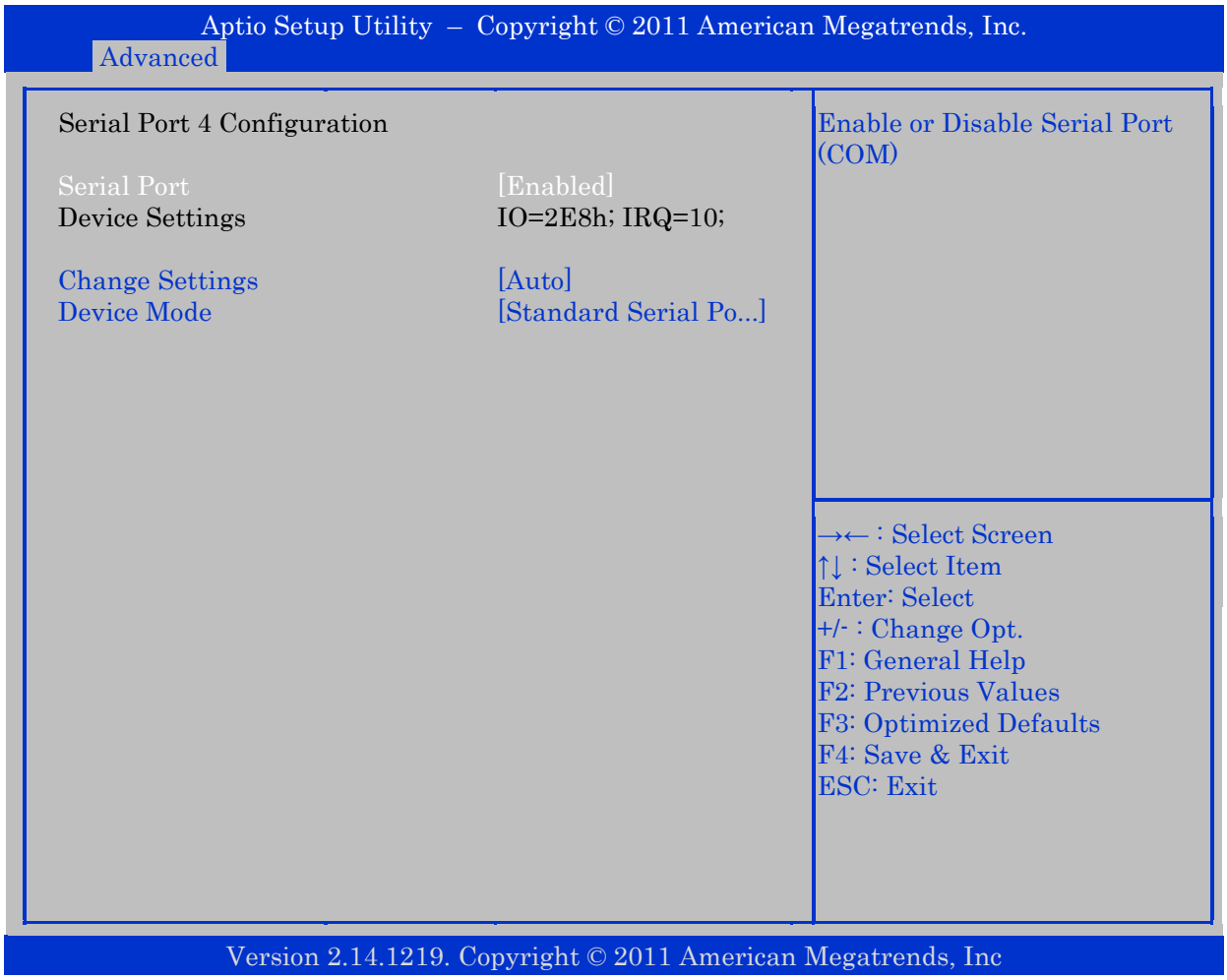
10.2.11.3 Serial Port 3 Configuration



Function	Selection	Description
Serial Port	Disabled **Enabled**	Enable or Disable Serial Port (COM)
Change Settings Note1	**Auto** IO=3E8h; IRQ=7; IO=3F8h; IRQ=3,4,5,6,7,10,11,12; IO=2F8h; IRQ=3,4,5,6,7,10,11,12; IO=3E8h; IRQ=3,4,5,6,7,10,11,12; IO=2E8h; IRQ=3,4,5,6,7,10,11,12;	Select an optimal setting for Super IO device.
Device Mode Note1	**Standard Serial Port Mode** IrDA 1.0 (HP SIR) Mode ASKIR Mode	Change the Serial Port mode. Select <High Speed> or <Normal mode> mode.

Note1: only if Serial Port = Enabled

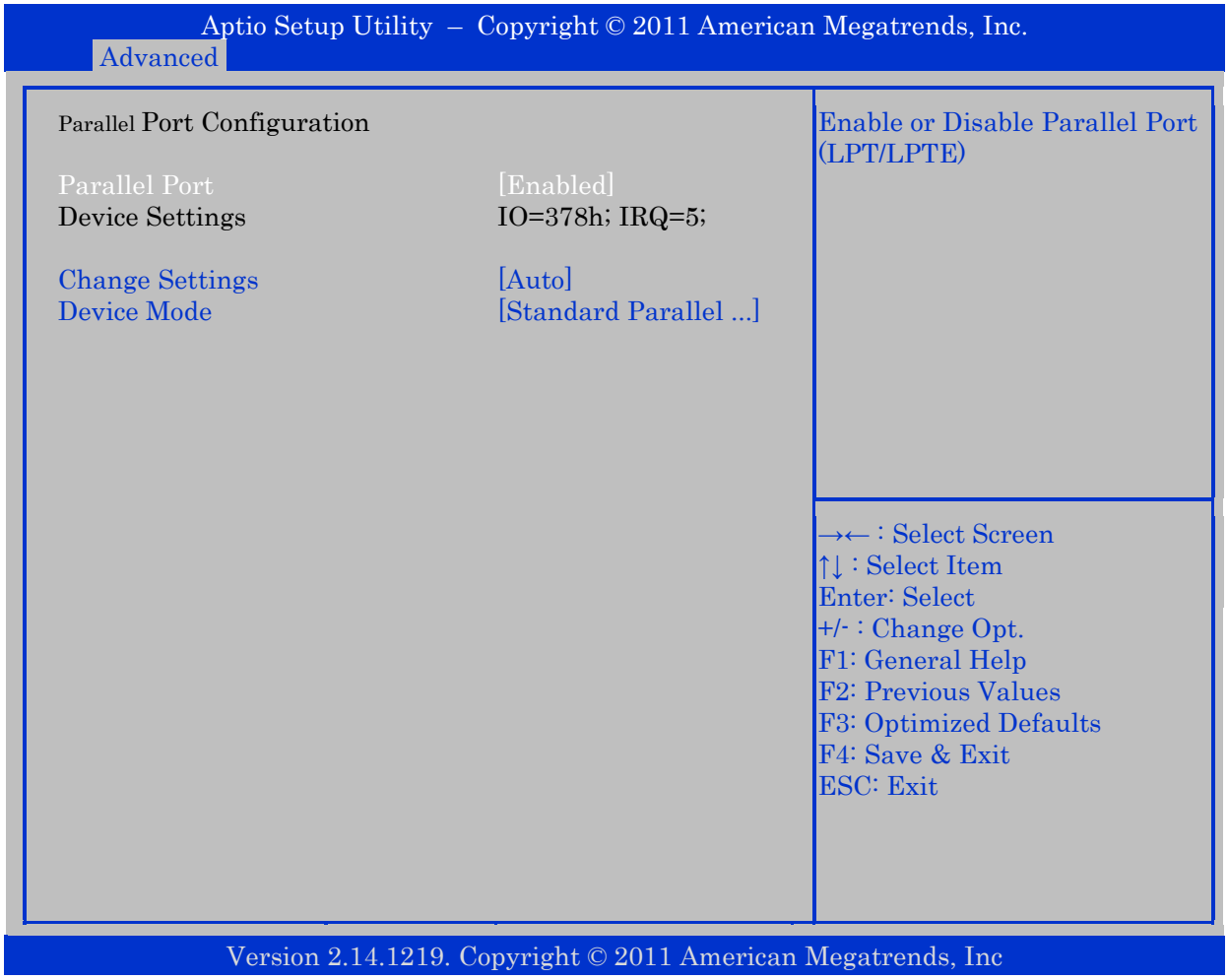
10.2.11.4 Serial Port 4 Configuration



Function	Selection	Description
Serial Port	Disabled **Enabled**	Enable or Disable Serial Port (COM)
Change Settings Note1	**Auto** IO=2E8h; IRQ=10; IO=3F8h; IRQ=3,4,5,6,7,10,11,12; IO=2F8h; IRQ=3,4,5,6,7,10,11,12; IO=3E8h; IRQ=3,4,5,6,7,10,11,12; IO=2E8h; IRQ=3,4,5,6,7,10,11,12;	Select an optimal setting for Super IO device.
Device Mode Note1	**Standard Serial Port Mode** IrDA 1.0 (HP SIR) Mode ASKIR Mode	Change the Serial Port mode. Select <High Speed> or <Normal mode> mode.

Note1: only if Serial Port = Enabled

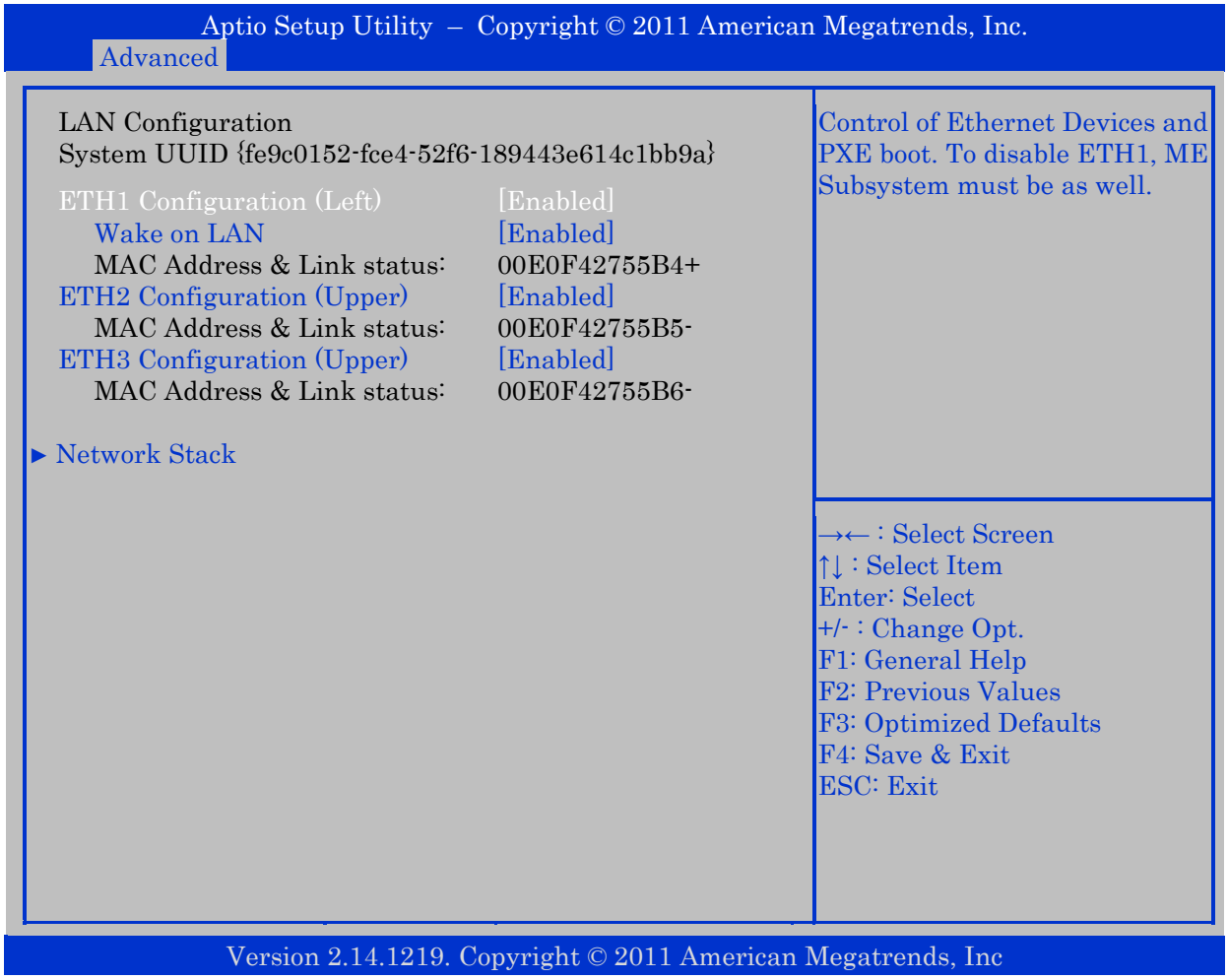
10.2.11.5 Parallel Port Configuration



Function	Selection	Description
Parallel Port	Disabled **Enabled**	Enable or Disable Parallel Port (LPT/LPTE)
Change Settings Note1	**Auto** IO=378h; IRQ=5; IO=378h; IRQ=7,10,11,12; IO=278h; IRQ=5,6,7,10,11,12; IO=3BCh; IRQ=5,6,7,10,11,12; IO=378h; IO=278h; IO=3BCh;	Select an optimal setting for Super IO device.
Device Mode Note1	**Standard Parsllel Port Mode** EPP Mode ECP Mode EPP Mode & ECP Mode	Change the Printer Port mode.

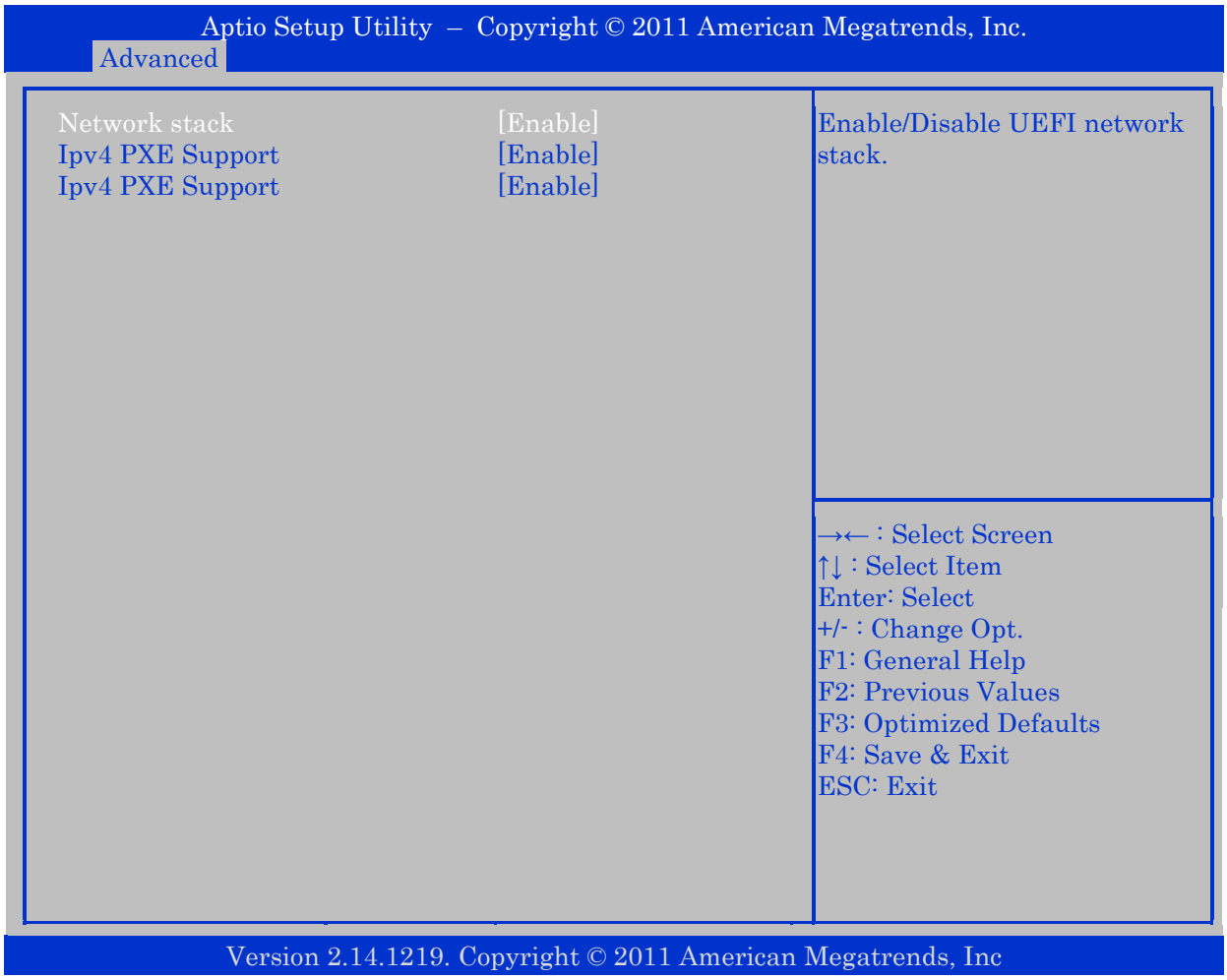
Note1: only if Parallel Port = Enabled

10.2.12 Advanced - LAN Configuration



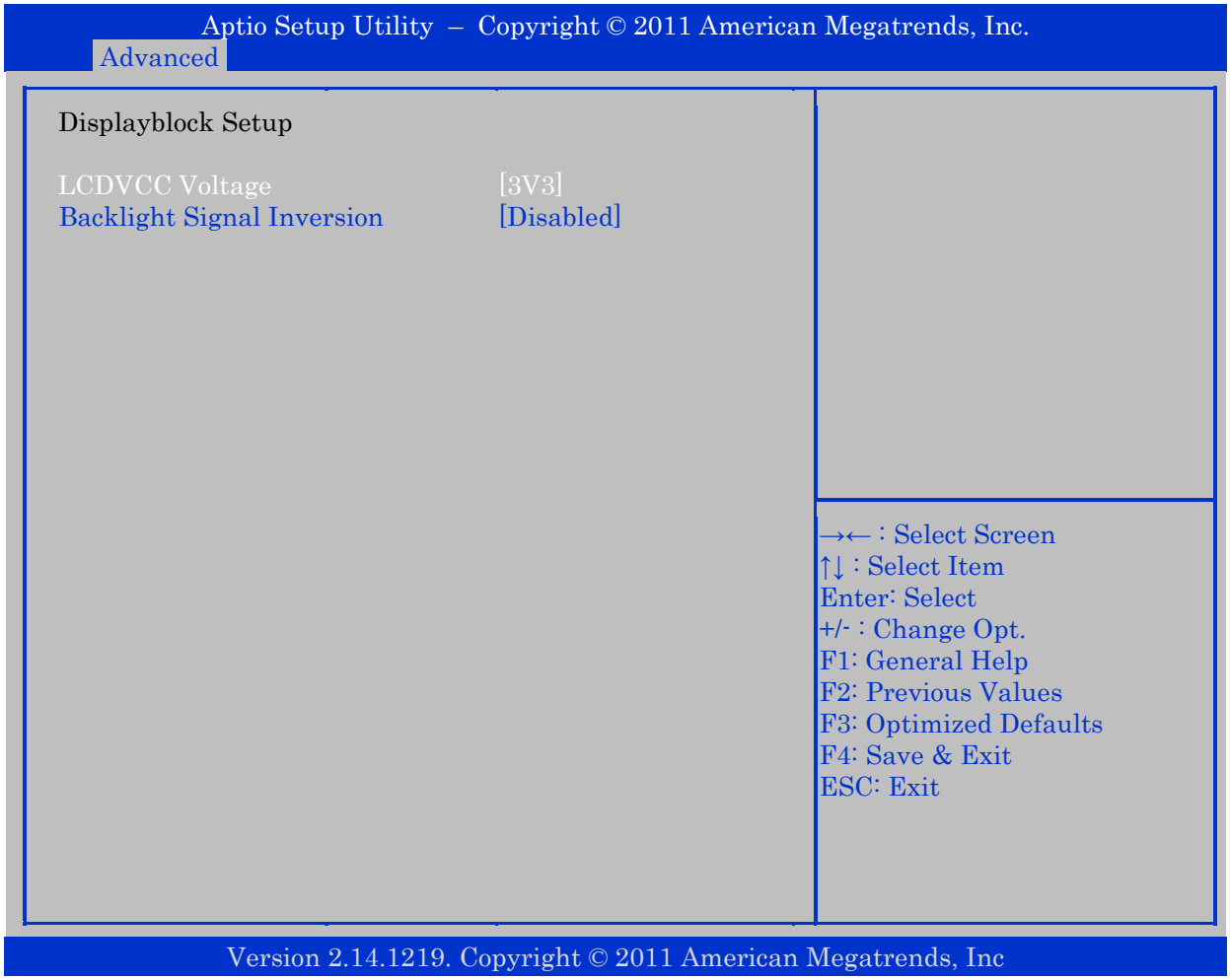
Function	Selection	Description
ETH1 Configuration (Left)	Disabled **Enabled** With PXE boot	Control of Ethernet Devices and PXE boot. To disable ETH1, ME Subsystem must be as well.
Wake on LAN	**Enabled** Disabled	Enable or disable integrated LAN to wake the system. (The Wake On LAN cannot be disabled if ME is on at Sx state.)
ETH2 Configuration (Upper)	Disabled **Enabled** With PXE boot	Control of Ethernet Devices and PXE boot. To disable ETH2, ME Subsystem must be as well.
ETH3 Configuration (Upper)	Disabled **Enabled** With PXE boot	Control of Ethernet Devices and PXE boot. To disable ETH3, ME Subsystem must be as well.

10.2.12.1 Network Stack



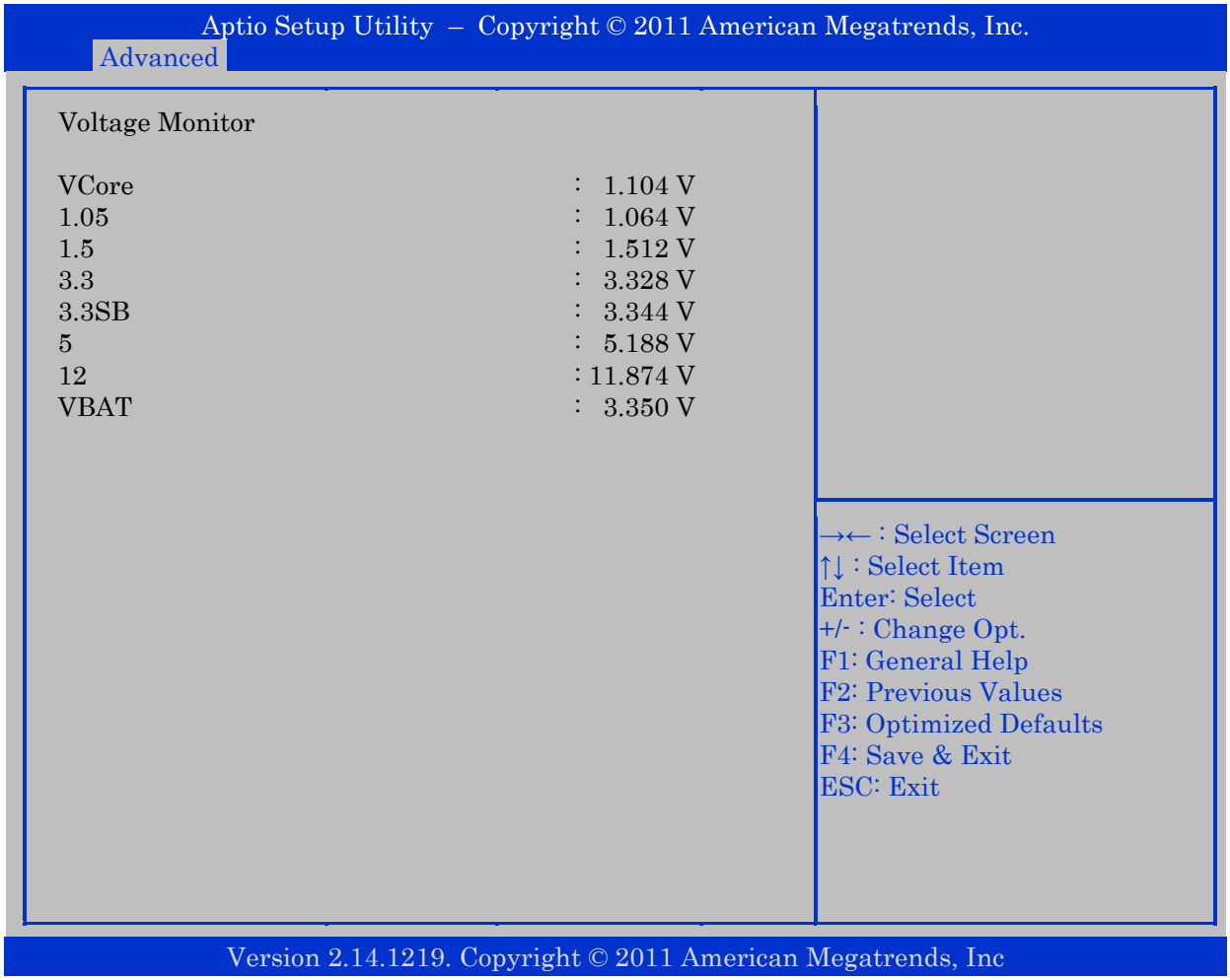
Function	Selection	Description
Network stack	**Disable Link** Enabled	Enable/Disable UEFI network stack.
Ipv4 PXE Support	**Enabled** Disabled	Enable Ipv4 PXE Boot Support. If disabled IPV4 PXE boot option will not be created.
Ipv6 PXE Support	**Enabled** Disabled	Enable Ipv6 PXE Boot Support. If disabled IPV6 PXE boot option will not be created.

10.2.13 Advanced - Displayblock Setup

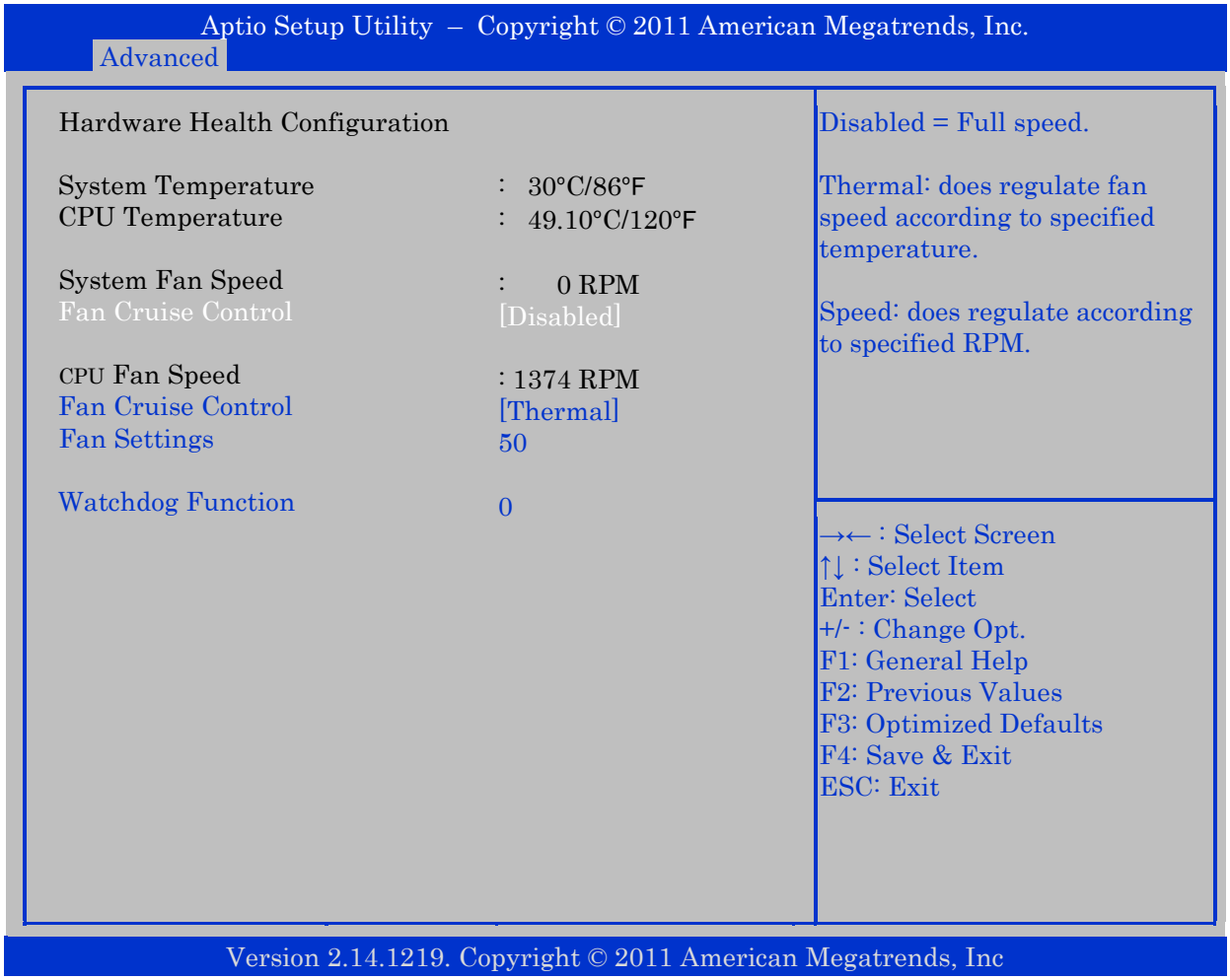


Function	Selection	Description
LCDVCC Voltage	**3V3** 5V	Set the LVDS Display Panel voltage to either 3.3V or 5V.
Backlight Signal Inversion	**Disabled** Enabled	Select Disabled if BKLTEN# signal (available in the LVDS connector), shall behave normally: active low to enable backlight. Select Enabled if BKLTEN# signal shall behave inversed: active high to enable backlight.

10.2.14 Advanced - Voltage Monitor



10.2.15 Advanced - Hardware Health Configuration



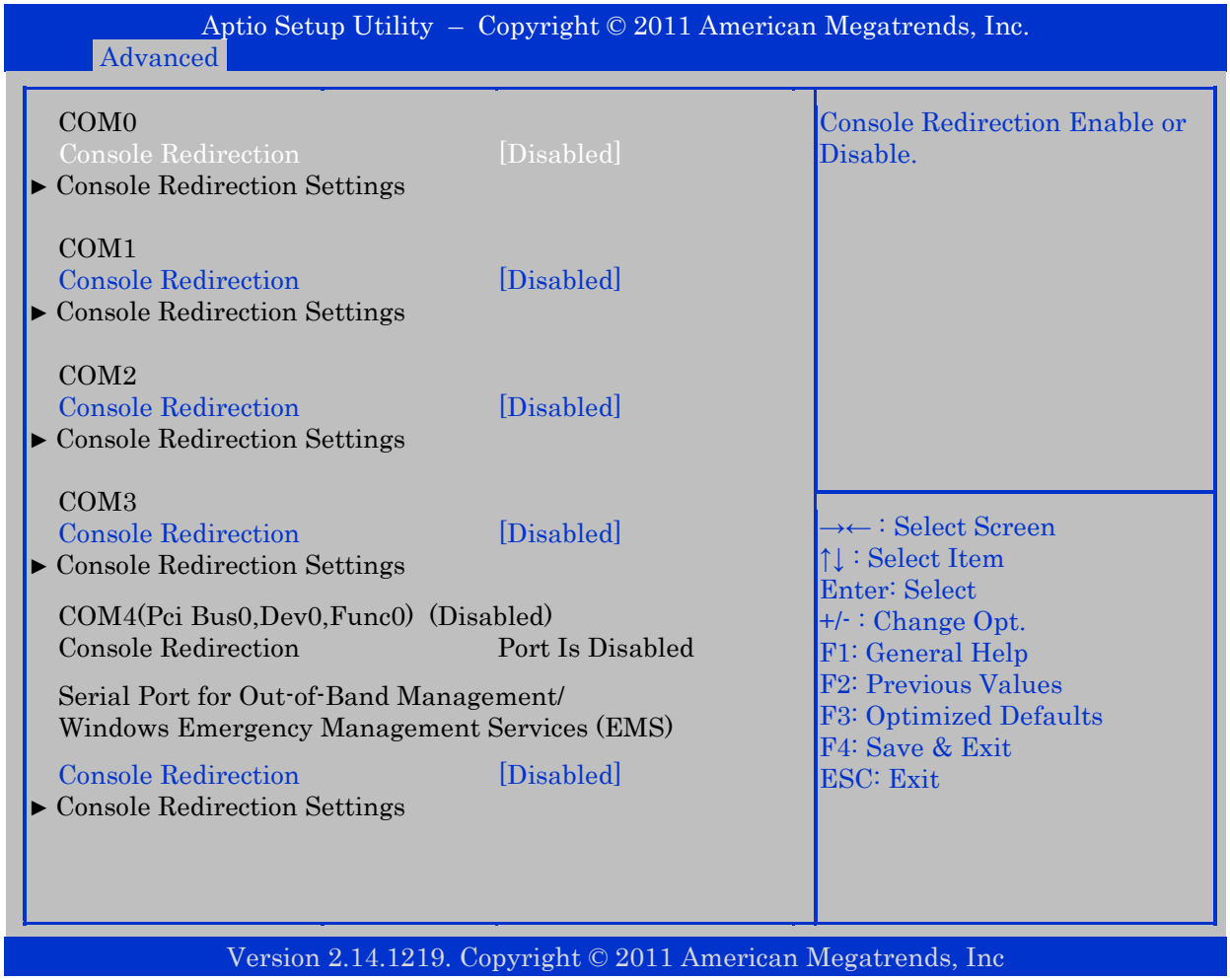
Function	Selection	Description
Fan Cruise Control	**Disabled** Speed	Disabled = Full speed. Speed: does regulate according to specified RPM.
Fan Cruise Control	**Disabled** Thermal Speed	Disabled = Full speed. Thermal: does regulate fan speed according to specified temperature. Speed: does regulate according to specified RPM.
Fan Settings	30 – 90 (note1) 1000 – 9999 (note2)	
Watchdog Function	0 - 255 (note3)	0 = Disabled. Enter the service interval in seconds before system will reset. Refer to manual how to reload the timer.

Note1: ºC (if Fan Cruise Control = Thermal) use either digit keys to enter value or +/- keys to increase/decrease value. Don't use mix of digit keys and +/- keys.

Note2: RPM (if Fan Cruise Control = Speed) use either digit keys to enter value or +/- keys to increase/decrease value by 100. Don't use mix of digit keys and +/- keys.

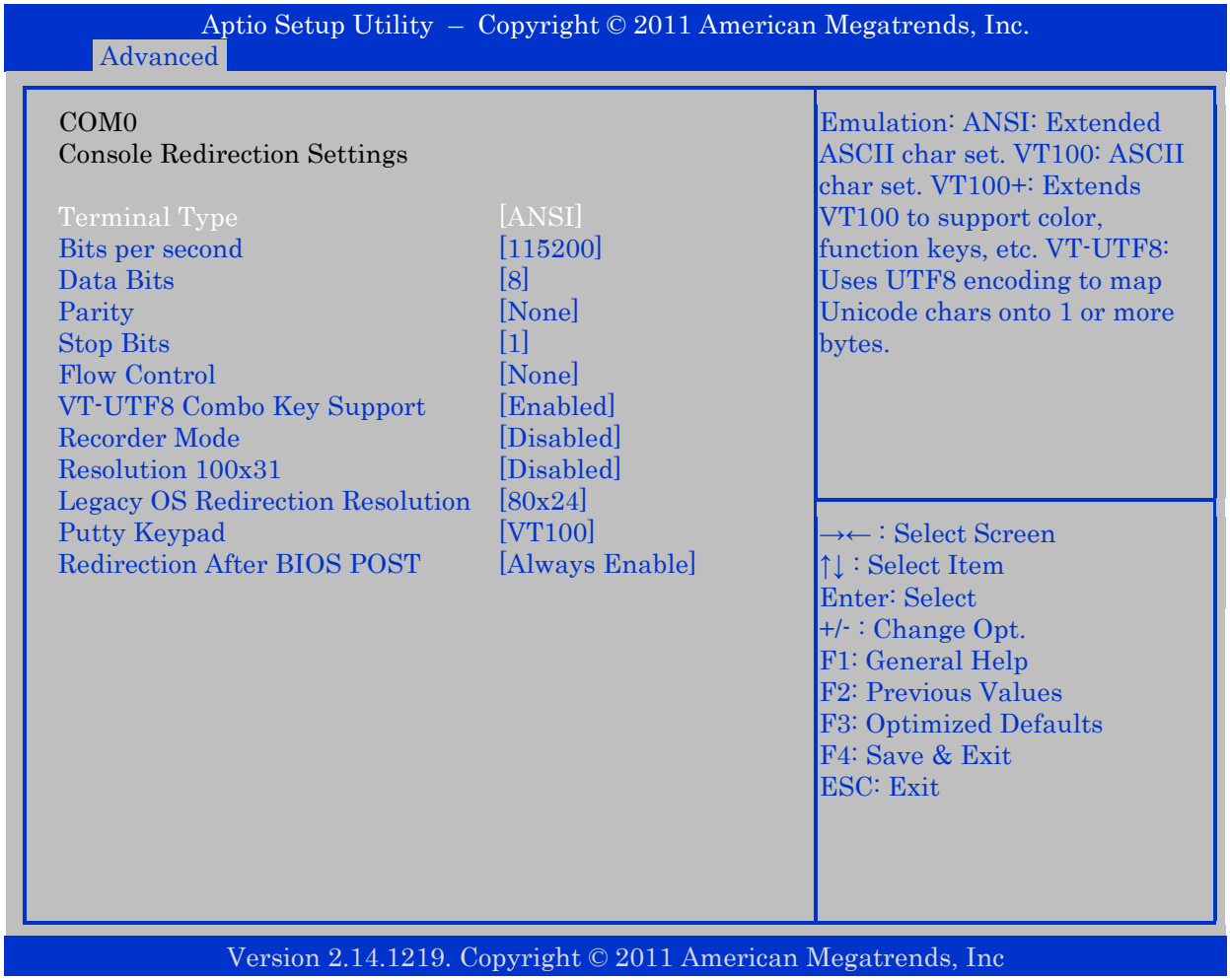
Note3: Seconds, use digit keys to enter value. Value 0 means Watchdog is disabled. Refer to "KT-API-V2 User Manual" to control the Watchdog via API or refer to "KT-API-V2 User Manual DLL" how to control Watchdog via Windows DLL.

10.2.16 Advanced - Serial Port Console Redirection

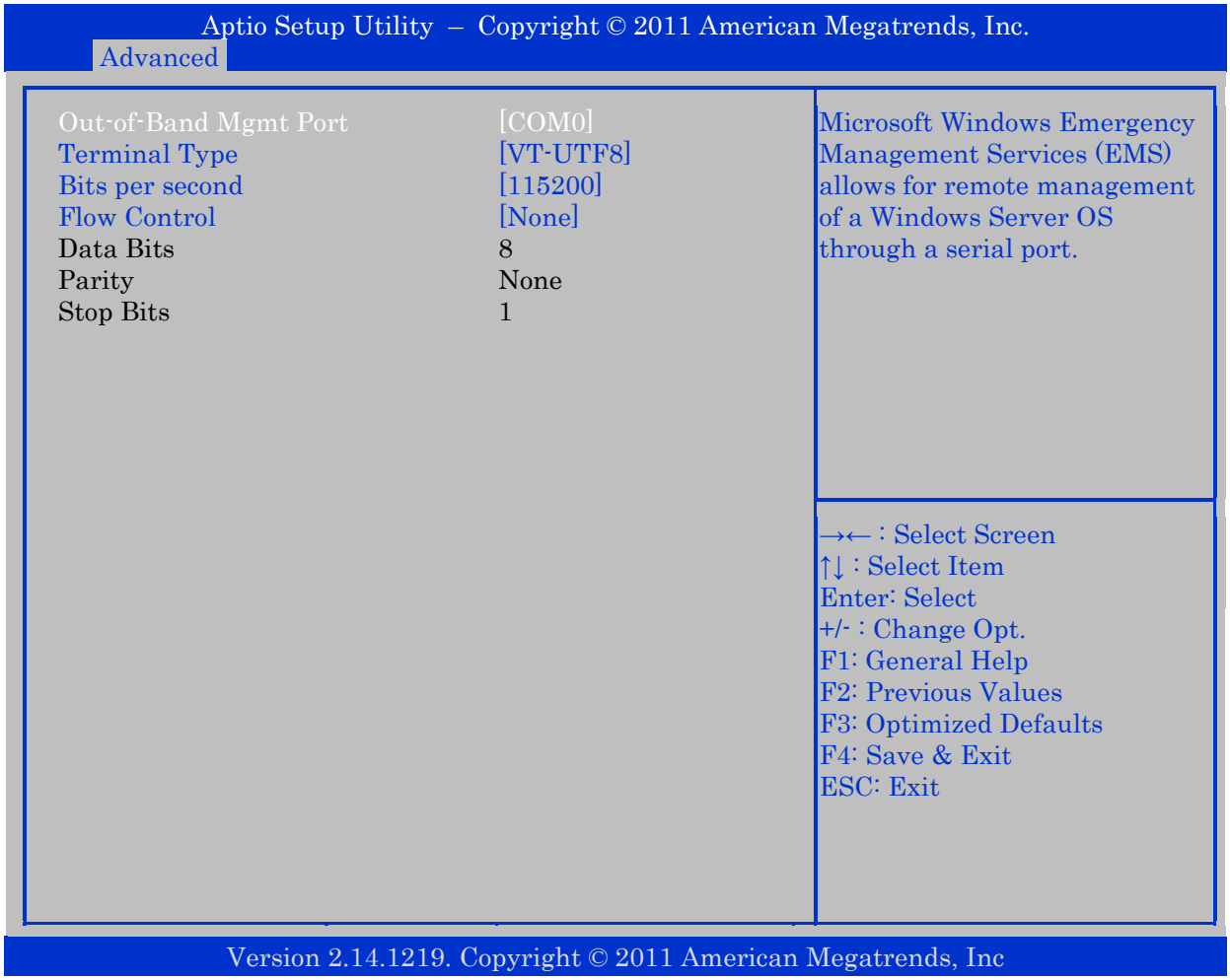


10.2.16.1 Console Redirection Settings

The “Console Redirection Settings” Menus are only available if related “Console Redirection” is Enabled. A different menu is available for Serial Port for Out-of-Band Management, se next page.

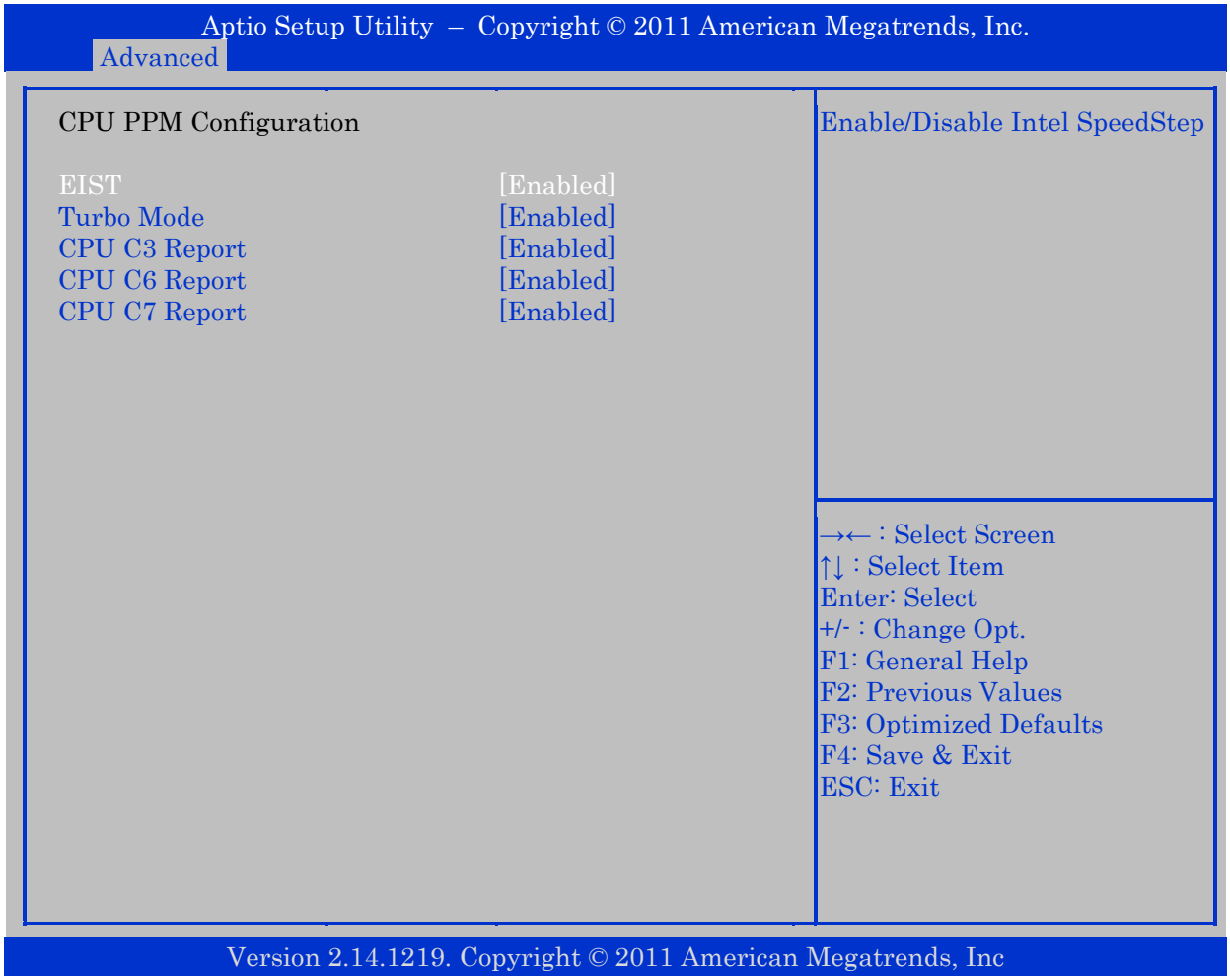


Function	Selection	Description
Terminal Type	VT100 VT100+ VT-UTF8 **ANSI**	Emulation: ANSI: Extended ASCII char set. VT100: ASCII char set. VT100+: Extends VT100 to support color, function keys, etc. VT-UTF8: Uses UTF8 encoding to map Unicode chars onto 1 or more bytes.
Bits per second	9600 19200 38400 57600 **115200**	Select serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds.
Data Bits	7, **8**	Data Bits
Parity	**None** Even Odd Mark Space	A parity bit can be sent with the data bits to detect some transmission errors. Even: parity bit is 0 if the num of 1's in the data bits is even. Odd: parity bit is 0 if the num of 1's in the data bits is odd. Mark: parity bit is always 1. Space: parity bit is always 0. Mark/Space do not allow error detection.
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	Disabled **Enabled**	Enable VT-UTF8 Combination Key Support for ANSI/VT100 terminals.
Recorder Mode	**Disabled** Enabled	On this mode enabled only text will be send. This is to capture Terminal data.
Resolution 100x31	**Disabled** Enabled	Enables or disables extended terminal resolution.
Legacy OS Redirection Resolution	**80x24** 80x25	On Legacy OS, the Number of Rows and Columns supported redirection.
Putty Keypad	**VT100** LINUX XTERMR6 SCO ESCN VT400	Select FunctionKey and KeyPad on Putty.
Redirection After BIOS POST	**Always Enable** BootLoader	The settings specify if BootLoader is selected than Legacy console redirection is disabled before booting to Legacy OS. Default value is Always Enable which means Legacy console Redirection is enabled for Legacy OS.



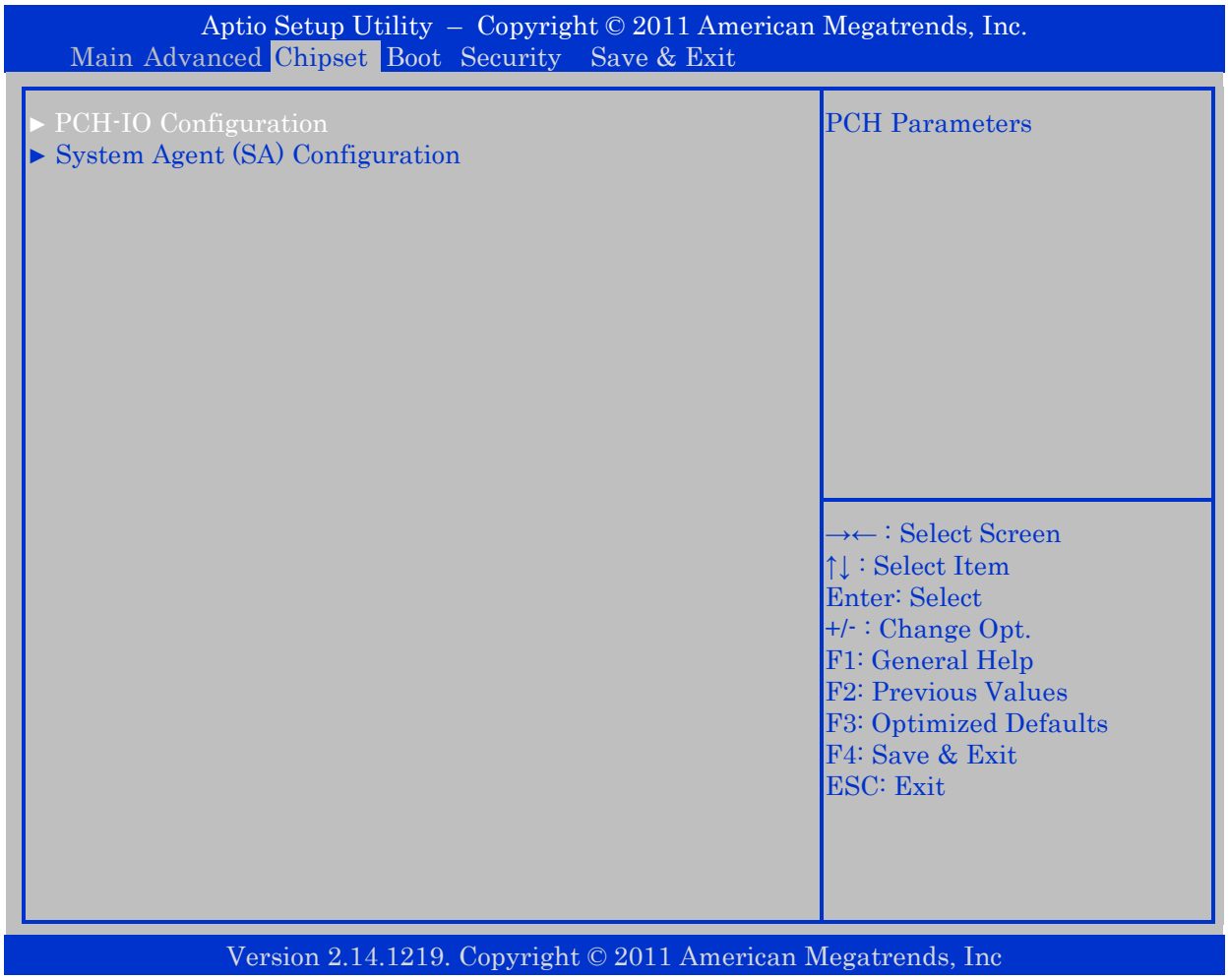
Function	Selection	Description
Out-of-Band Mgmt Port	**COM0** COM1 COM2 COM3 COM4 (Pci Bus0,Dev0, Func0) (Disabled)	Microsoft Windows Emergency Management Services (EMS) allows for remote management of a Windows Server OS through a serial port.
Terminal Type	VT100 VT100+ **VT-UTF8** ANSI	VT-UTF8 is the 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 second	9600 19200 57600 **115200**	Select 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.

10.2.17 Advanced - CPU PPM Configuration

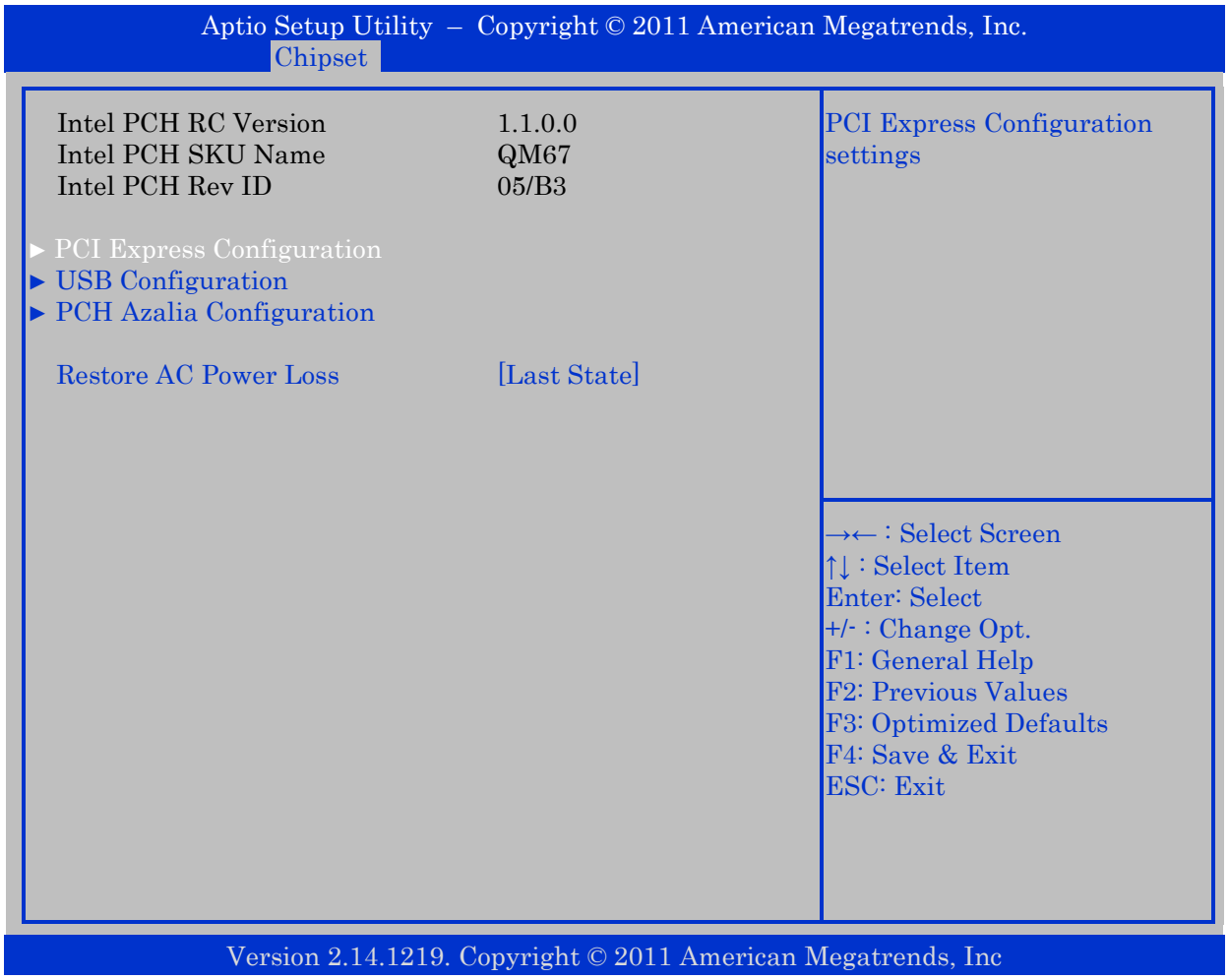


Function	Selection	Description
EIST	Disabled **Enabled**	Enable/Disable Intel SpeedStep.
Turbo Mode	Disabled **Enabled**	Turbo Mode
CPU C3 Report	Disabled **Enabled**	Enable/Disable CPU C3 (ACPI C2) report to OS
CPU C6 Report	Disabled **Enabled**	Enable/Disable CPU C6 (ACPI C3) report to OS
CPU C7 Report	Disabled **Enabled**	Enable/Disable CPU C7 (ACPI C3) report to OS

10.3 Chipset


Aptio Setup Utility – Copyright © 2011 American Megatrends, Inc.
Main Advanced Chipset Boot Security Save & Exit
► PCH-IO Configuration
► System Agent (SA) Configuration
PCH Parameters
→← : Select Screen
↑↓ : Select Item
Enter: Select
+/- : Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
Version 2.14.1219. Copyright © 2011 American Megatrends, Inc

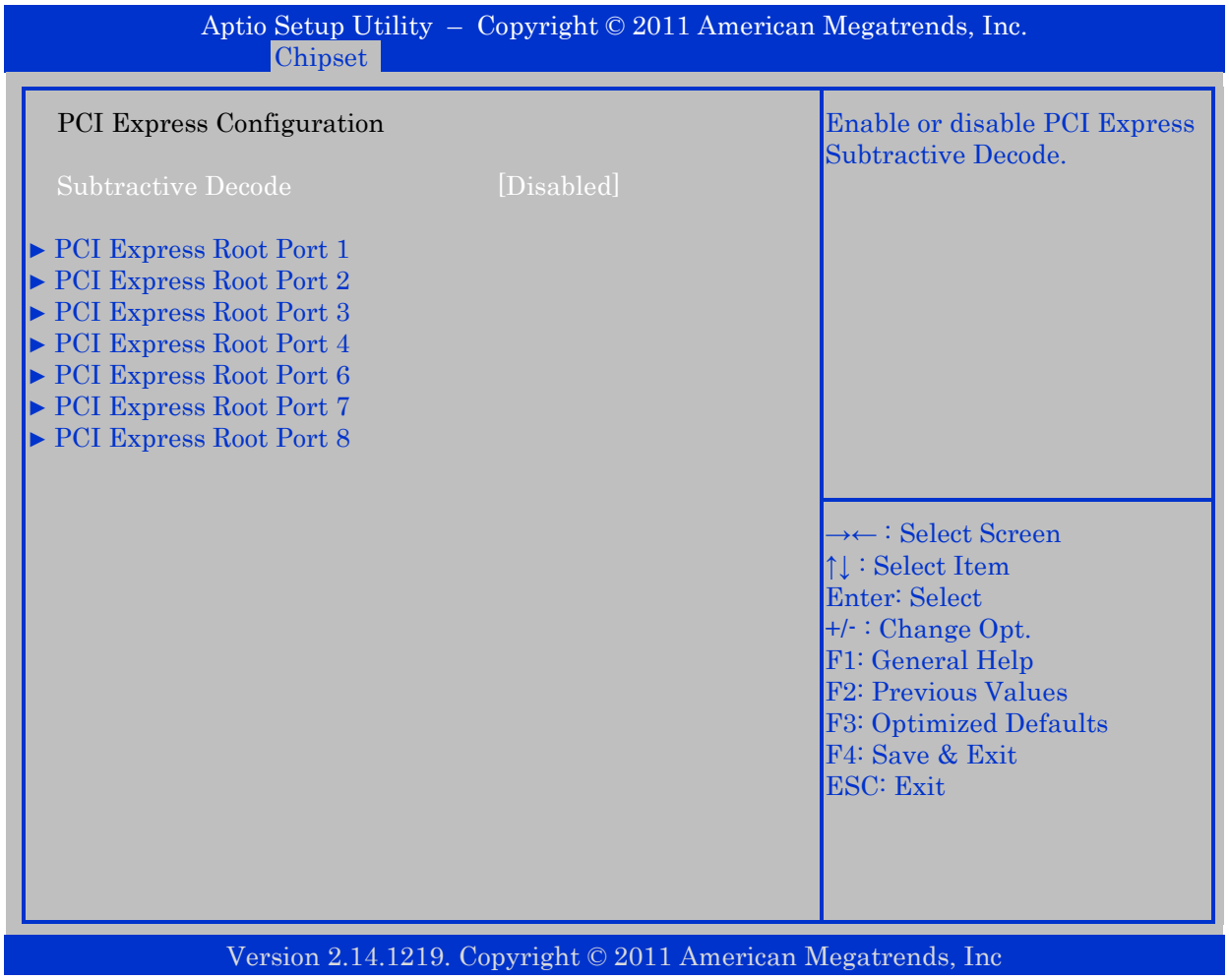
10.3.1 PCH-IO Configuration



Please find description of the “PCI Express Configuration”, “USB Configuration” and “PCH Azalia Configuration” on the following pages.

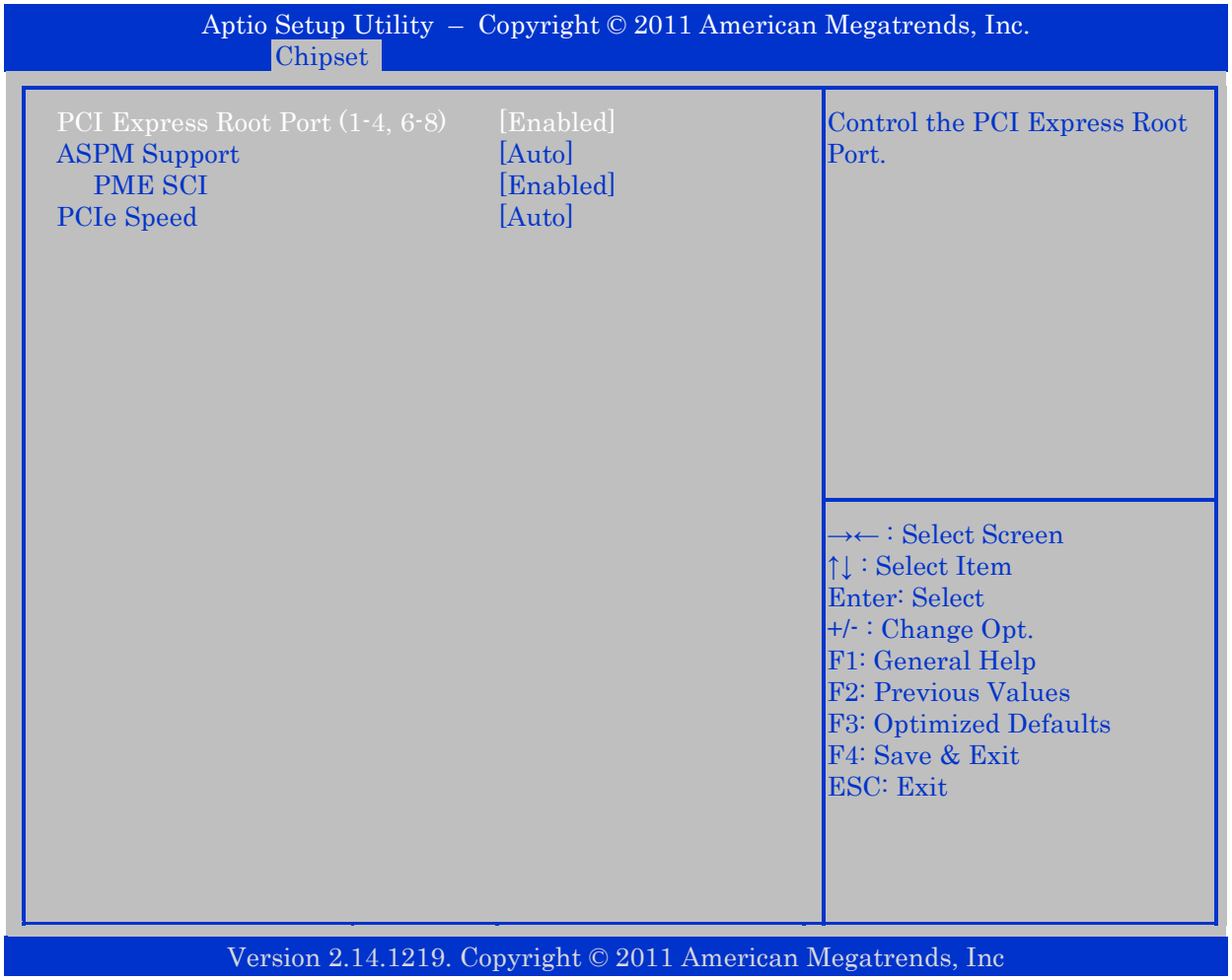
Function	Selection	Description
Restore AC Power Loss	Power Off Power On **Last State**	Select AC Power state when power is re-applied after a power failure.

10.3.1.1 PCI Express Configuration



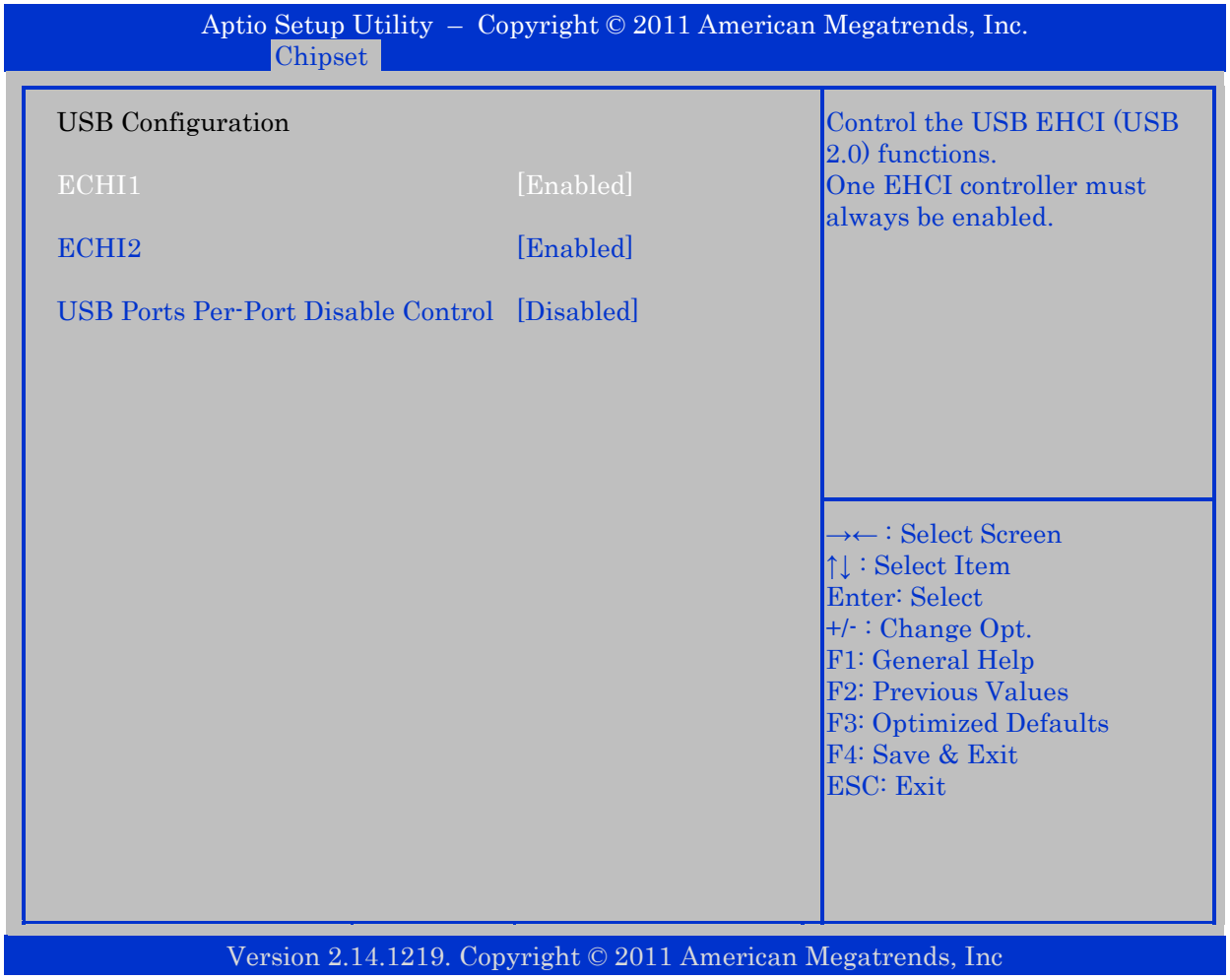
Function	Selection	Description
Subtractive Decode	**Disabled** Enabled	Enable or disable PCI Express Subtractive Decode.

10.3.1.1.1 PCI Express Root Port (1-4, 6-8)



Function	Selection	Description
PCI Express Root Port (1-4, 6-8)	Disabled **Enabled**	Control the PCI Express Root Port.
ASPM Support	Disabled L0s L1 L0sL1 **Auto**	Set the ASPM Level. Disabled: Disabled ASPM L0s: Force all links to L0s State Auto: BIOS auto configure
PME SCI	Disabled **Enabled**	Enable or disable PCI Express PME SCI.
PCIe Speed	**Auto** Gen1 Gen2	Select PCI Express port speed.

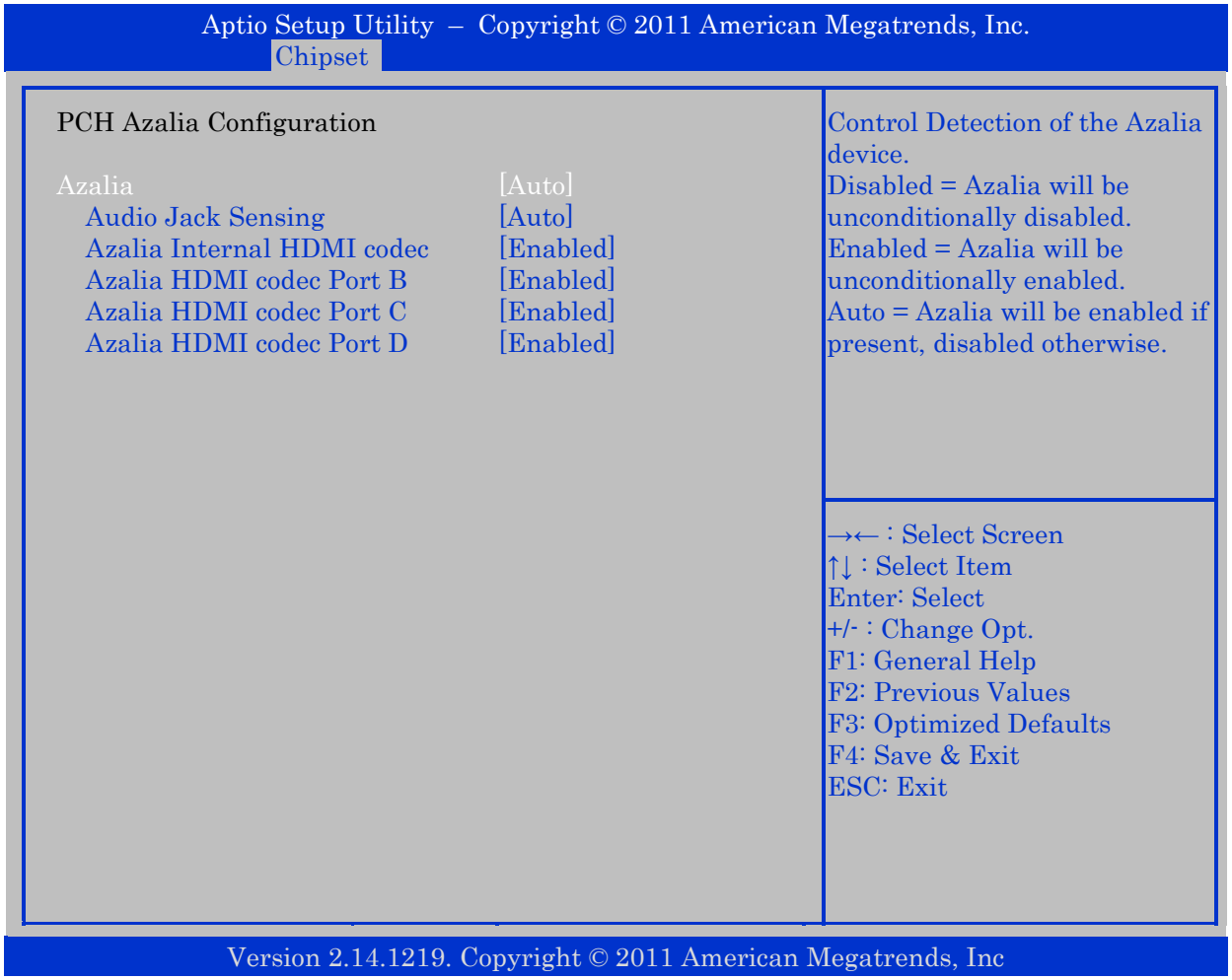
10.3.1.2 USB Configuration



Function	Selection	Description
ECHI1	Disabled **Enabled**	Control the USB EHCI (USB 2.0) functions. One EHCI controller must always be enabled.
ECHI2	Disabled **Enabled**	Control the USB EHCI (USB 2.0) functions. One EHCI controller must always be enabled.
USB Ports Per-Port Disable Control	**Disabled** Enabled	Control each of the USB ports (0 – 13) disabling.
USB Port #(0-13) Disabled (Note1)	Disabled **Enabled**	Disabled USB port.

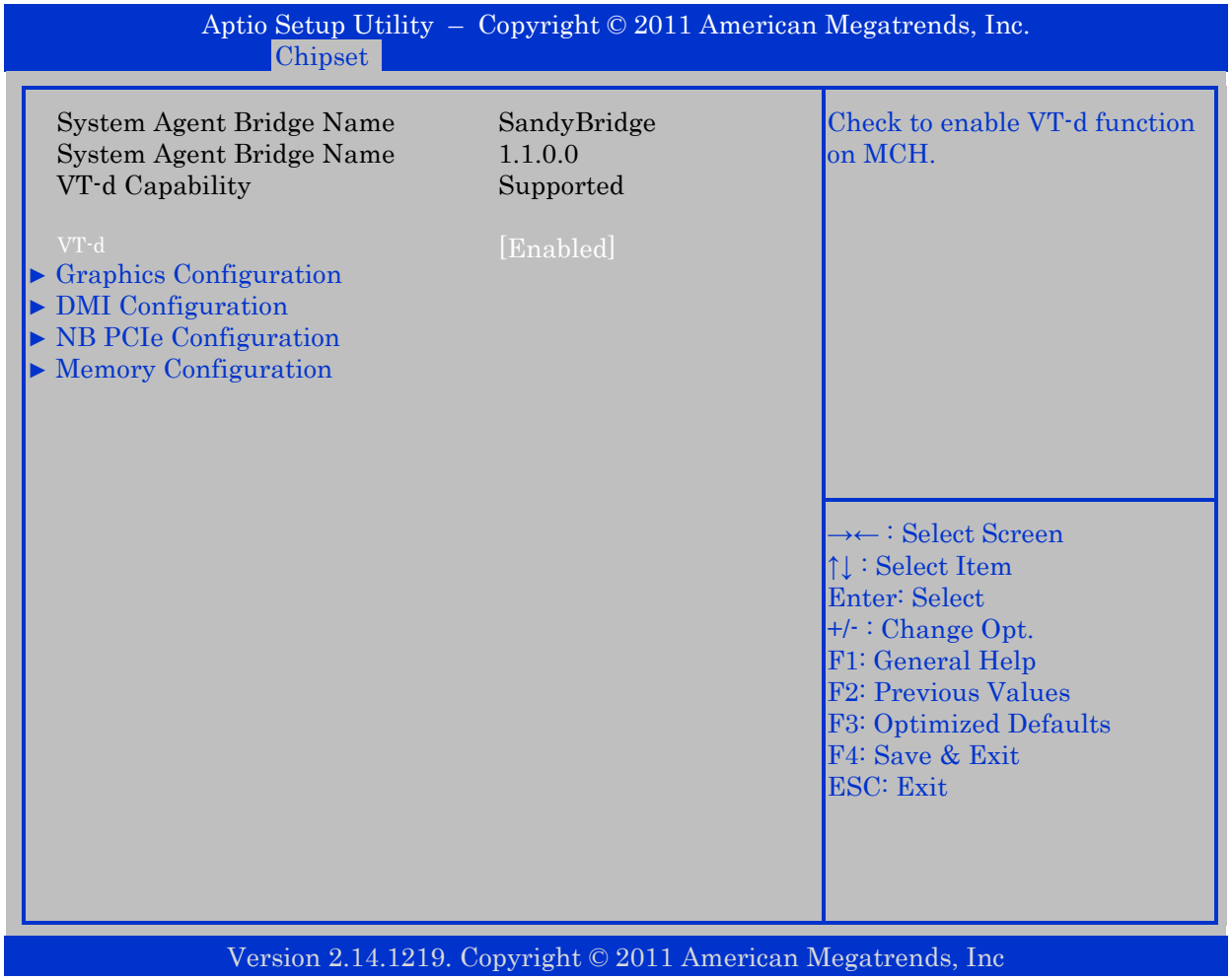
Note1: Only visible if “USB Ports Per-Port Disable Control” is Enabled.

10.3.1.3 PCH Azalia Configuration



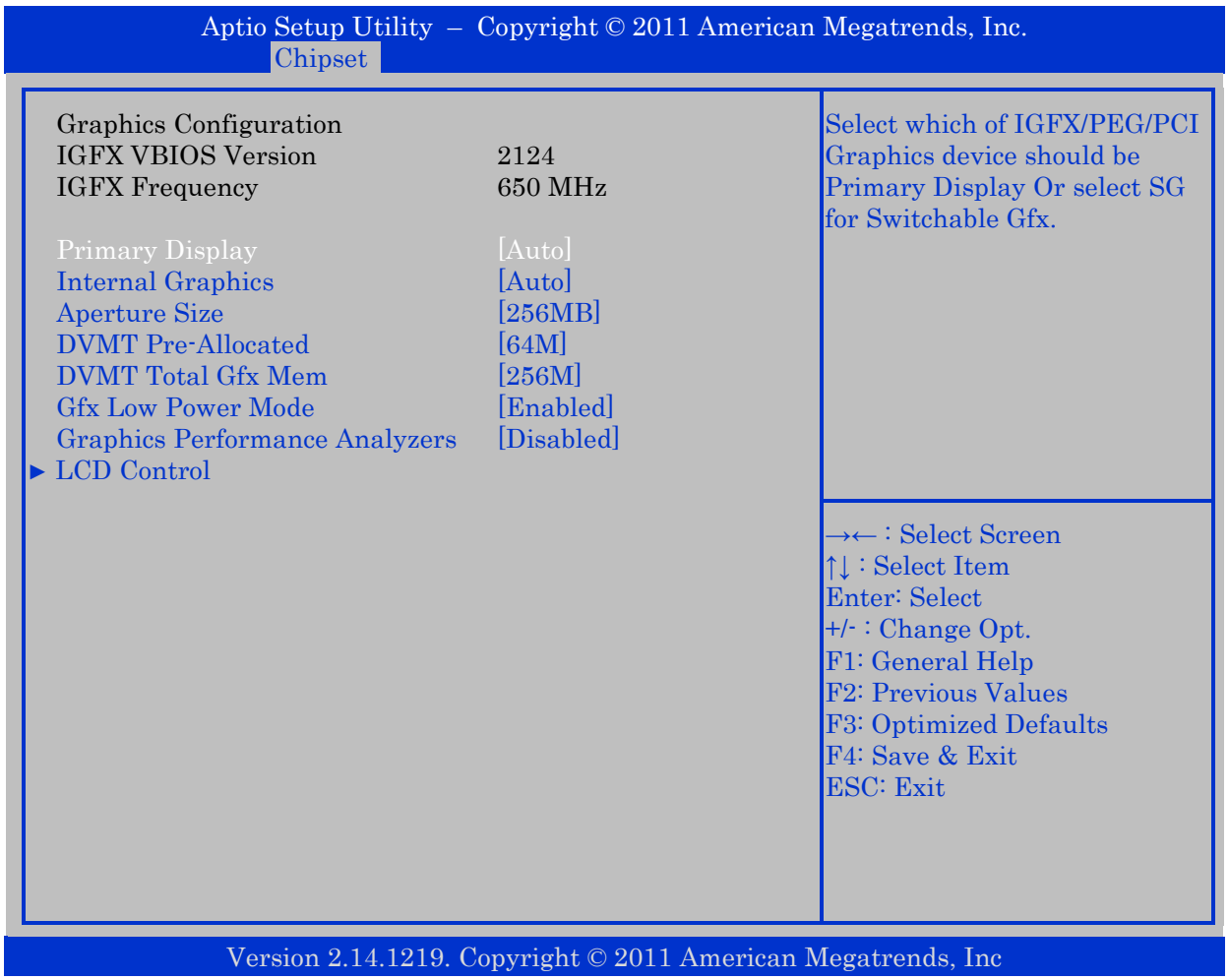
Function	Selection	Description
Azalia	Disabled Enabled **Auto**	Control Detection of the Azalia device. Disabled = Azalia unconditionally disabled. Enabled = Azalia unconditionally enabled. Auto = Azalia enabled if present, disabled otherwise.
Audio Jack Sensing	Disabled **Auto**	Auto: The insertions of audio jacks are auto determined. Disabled: Driver assumes that all jacks are inserted (useful when using the Audio pinrow)
Azalia Internal HDMI codec	Disabled **Enabled**	Enable or disable internal HDMI codec for Azalia.
Azalia HDMI codec PortB	Disabled **Enabled**	Enable or disable internal HDMI codec for Azalia.
Azalia HDMI codec PortC	**Disabled** Enabled	Enable or disable internal HDMI codec for Azalia.
Azalia HDMI codec PortD	Disabled **Enabled**	Enable or disable internal HDMI codec for Azalia.

10.3.2 System Agent (SA) Configuration



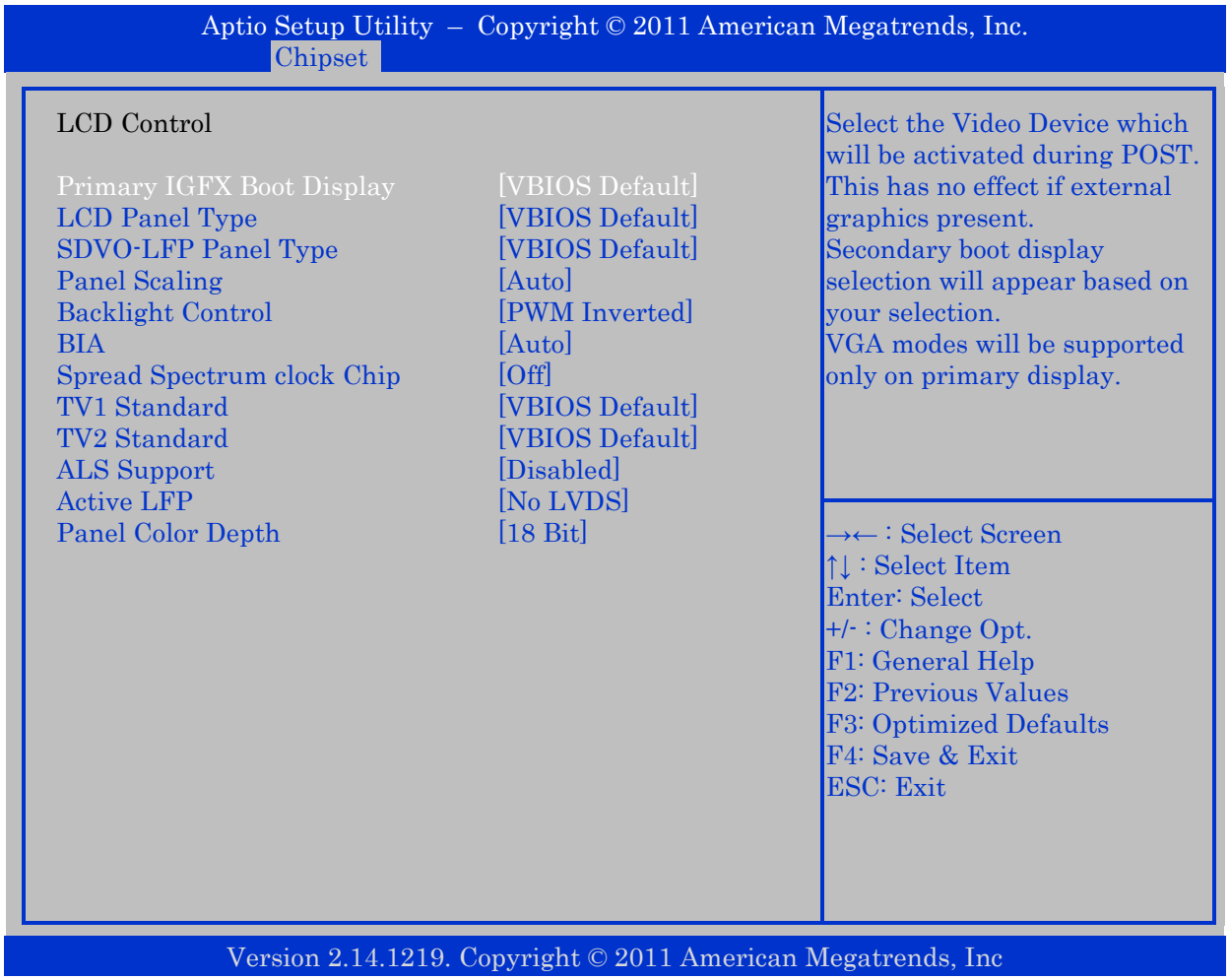
Function	Selection	Description
VT-d	Disabled **Enabled**	Check to enable VT-d function on MCH.

10.3.2.1 Graphics Configuration



Function	Selection	Description
Primary Display	**Auto** IGFX PEG PCI	Select which of IGFX/PEG/PCI Graphics device should be Primary Display Or select SG for Switchable Gfx.
Internal Graphics	**Auto** Disabled Enabled	Keep IGD enabled based on the setup options.
Aperture Size	128MB **256MB** 512MB	Select the Aperture Size.
DVMT Pre-Allocated	32M, **64M**, 96M,128M, 160M, 192M, 224M, 256M, 288M, 320M, 352M, 384M, 416M, 448M, 480M, 512M, 1024M	Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.
DVMT Total Gfx Mem	128M **256M** MAX	Select DVMT 5.0 Total Graphics Memory size used by the Internal Graphics Device.
Gfx Low Power Mode	**Enabled** Disabled	This option is applicable for SSF only.
Graphics Performance Analyzers	Enabled **Disabled**	Enable or disable Intel Graphics Performance Analyzers Counters.

10.3.2.1.1 LCD Control

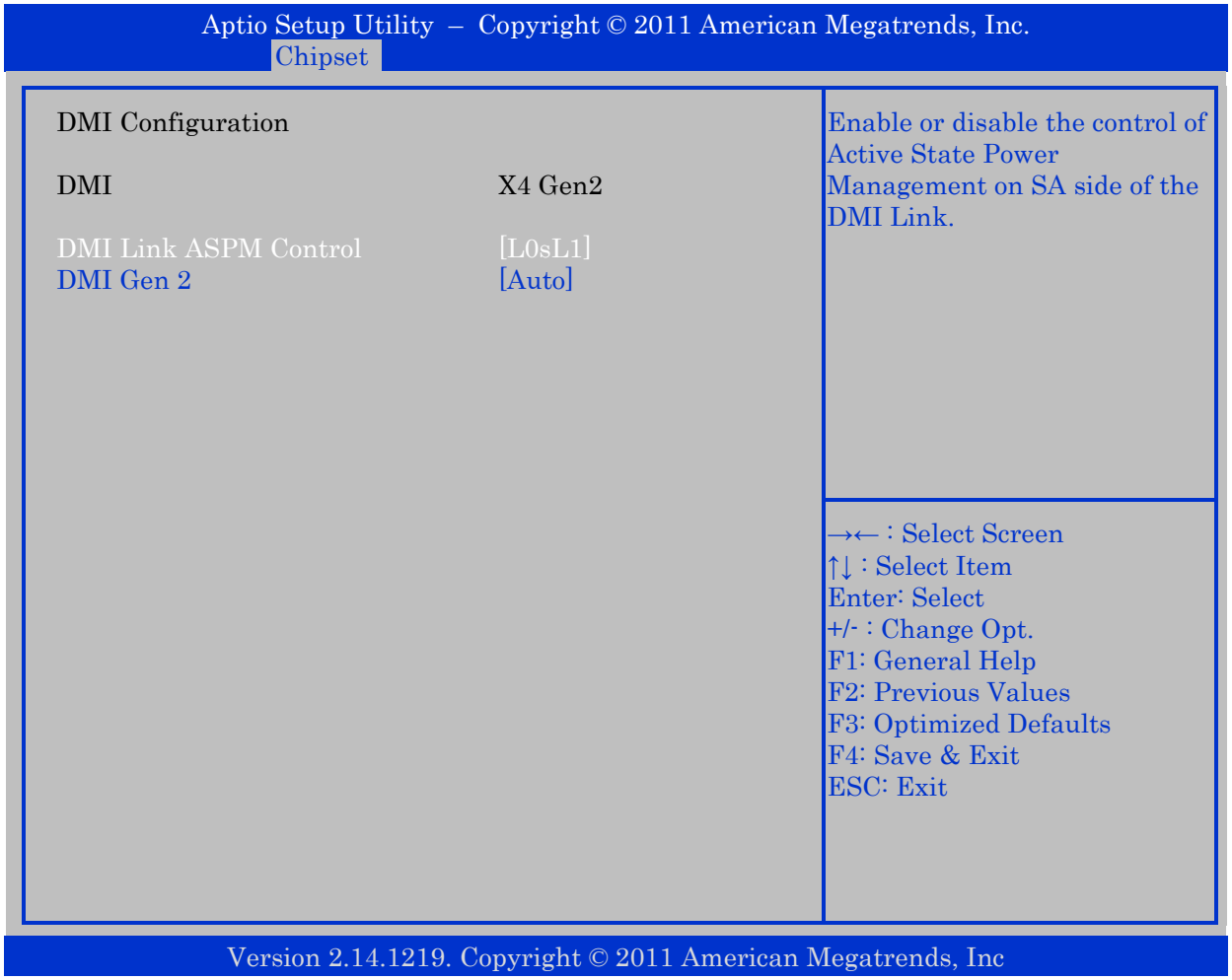


Function	Selection	Description
Primary IGFX Boot Display	**VBIOS Default** CRT EFP LFP EFP3 EFP2 LFP2	Select the Video Device which will be activated during POST. This has no effect if external graphics present. Secondary boot display selection will appear based on your selection. VGA modes will be supported only on primary display.
LCD Panel Type	**VBIOS Default** 640x480 LVDS 800x600 LVDS 1024x768 LVDS1 1280x1024 LVDS 1400x1050(RB) LVDS1 1400x1050 LVDS2 1600x1200 LVDS 1366x768 LVDS 1680x1050 LVDS 1920x1200 LVDS 1440x900 LVDS 1600x900 LVDS 1024x768 LVDS2 1280x800 LVDS 1920x1080 LVDS 2048x1536 LVDS	Select LCD panel used by Internal Graphics Device by selecting the appropriate setup item.
SDVO-LFP Panel Type	**VBIOS Default** 1024x768 SDVO-LFP 1280x1024 SDVO-LFP 1400x1050 SDVO-LFP 1600x1200 SDVO-LFP	Select SDVO panel used by Internal Graphics Device by selecting the appropriate setup item.
Panel Scaling	**Auto** Off Force Scaling	Select the LCD panel scaling option used by Internal Graphics Device.
Backlight Control	**PWM Inverted** PWM Normal GMBus Inverted GMBus Normal	Backlight Control Setting
BIA	**Auto** Disabled Level 1 Level 2 Level 3 Level 4 Level 5	Auto: GMCH use VBT defaults. Level n: Enabled with selected Aggressiveness Level.
Spread Spectrum clock Chip	**Off** Hardware Software	Hardware: Spread is controlled by chip. Software: Spread is controlled by BIOS.

Function	Selection	Description
TV1 Standard	**VBIOS Default** NTSC_M NTSC_M_J NTSC_433 PAL_B PAL_G PAL_D PAL_H PAL_I PAL_M PAL_N SECAM_L SECAM_B SECAM_D SECAM_G SECAM_H SECAM_K HDTV_STD_SMPTE_240M_1080i59 HDTV_STD_SMPTE_240M_1080i60 HDTV_STD_SMPTE_295M_1080i50 HDTV_STD_SMPTE_295M_1080p50 HDTV_STD_SMPTE_296M_720p50 HDTV_STD_SMPTE_296M_720p60 HDTV_STD_CEAEIA_7702A_480p60 HDTV_STD_CEAEIA_7702A_480i60	Select the ability to configure a TV Format.
TV2 Standard	**VBIOS Default** NTSC_M NTSC_M_J NTSC_433 PAL_B PAL_G PAL_D PAL_H PAL_I PAL_M PAL_N SECAM_L SECAM_B SECAM_D SECAM_G SECAM_H SECAM_K HDTV_STD_SMPTE_240M_1080i59 HDTV_STD_SMPTE_240M_1080i60 HDTV_STD_SMPTE_295M_1080i50 HDTV_STD_SMPTE_295M_1080p50 HDTV_STD_SMPTE_296M_720p50 HDTV_STD_SMPTE_296M_720p60 HDTV_STD_CEAEIA_7702A_480p60 HDTV_STD_CEAEIA_7702A_480i60	Select the ability to configure a TV Minor Format.

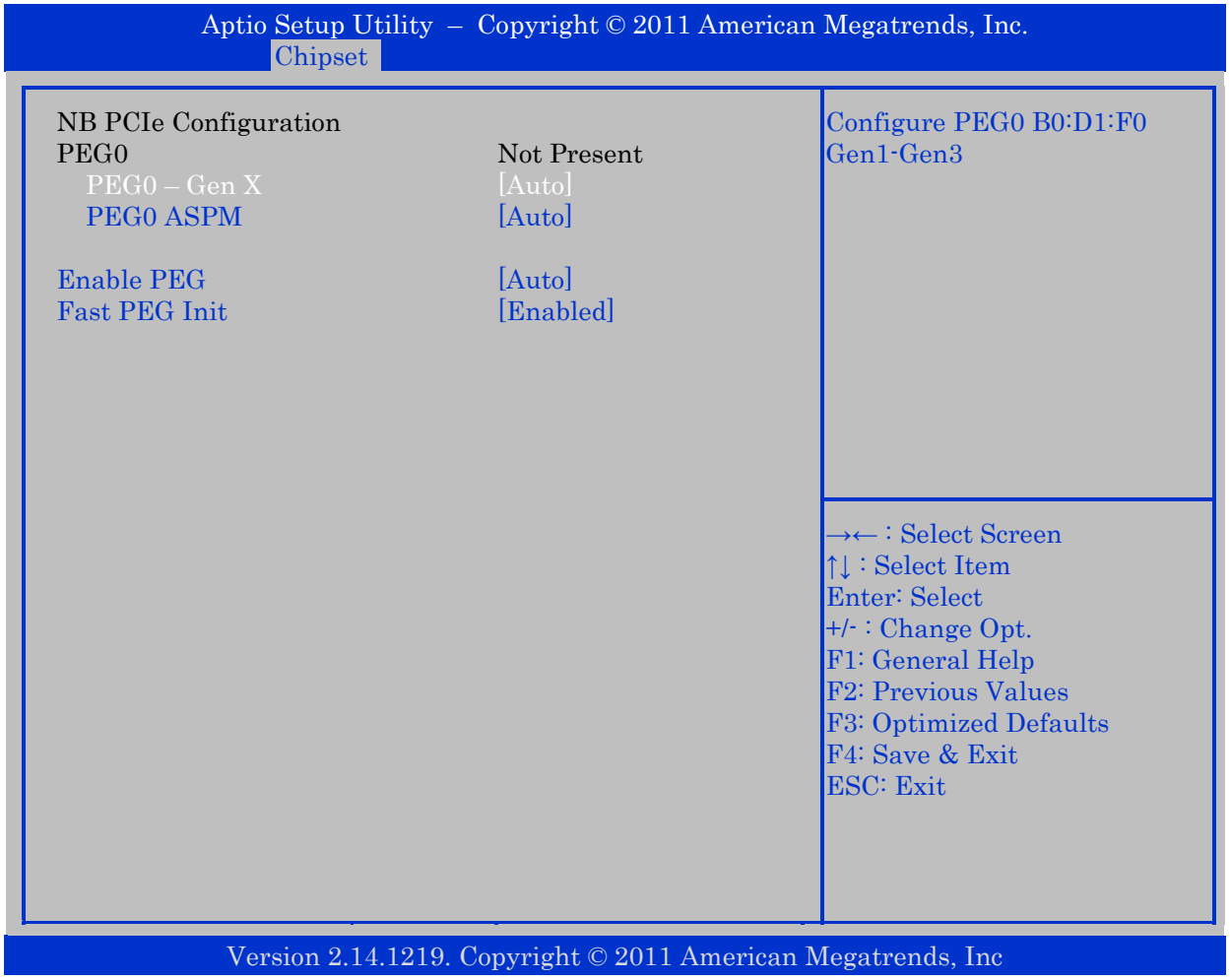
Function	Selection	Description
ALS Support	Enabled **Disabled**	Valid only for ACPI. Legacy = ALS Support through the IGD INT10 function. SCPI = ALS support through an ACPI ALS driver.
Active LFP	**No LVDS** Int-LVDS SDVO LVDS eDP Port-A eDP Port-D	Select the Active LFP Configuration. No LVDS: VBIOS does not enable LVDS. Int-LVDS: VBIOS enables LVDS driver by SDVO encoder. SDVO LVDS: VBIOS enables LVDS driver by SDVO encoder. eDP Port-A: LFP driven by Int-DisplayPort encoder from Port-A.
Panel Color Depth	**18 Bit** 24 Bit	Select the LFP Panel Color Depth.

10.3.2.2 DMI Configuration



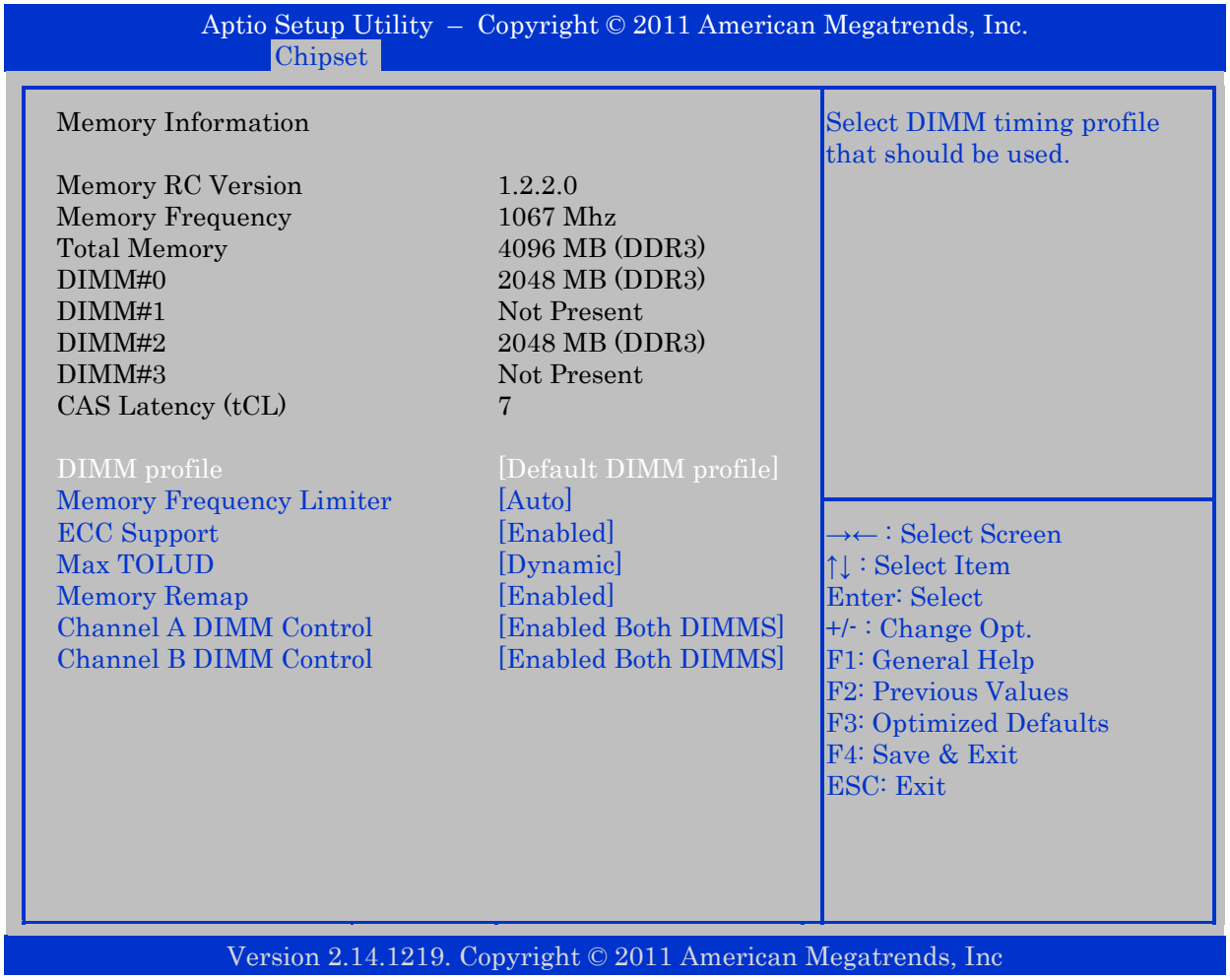
Function	Selection	Description
DMI Link ASPM Control	Disabled L0s L1 **L0sL1**	Enable or disable the control of Active State Power Management on SA side of the DMI Link.
DMI Gen 2	**Auto** Enabled Disabled	Enable or disable DMI Gen 2. Auto means Disabled for IVB A0 MB/DT and IVB B0 MB, Enabled for other CPUs.

10.3.2.3 NB PCIe Configuration



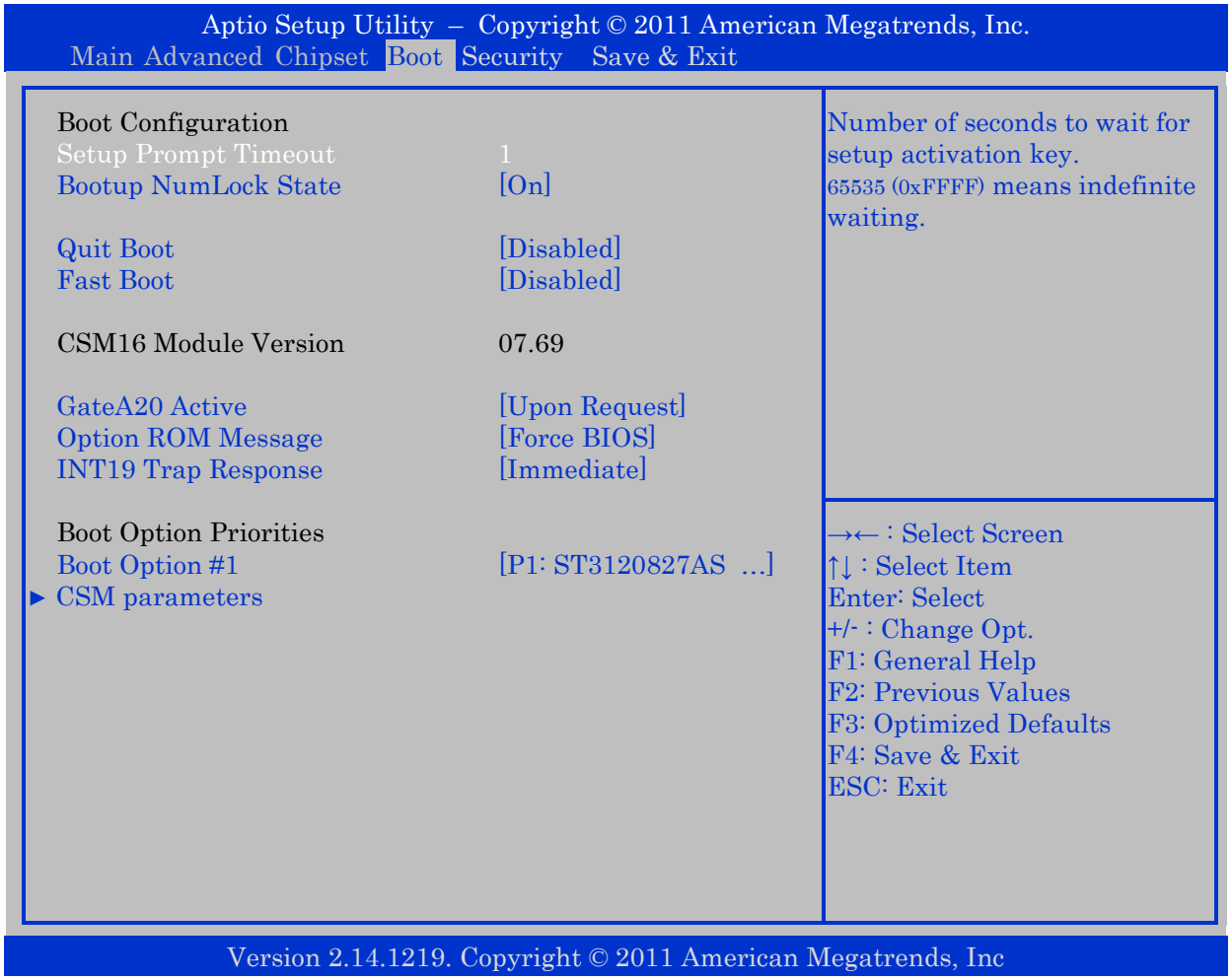
Function	Selection	Description
PEG0 – Gen X	**Auto** GEN1 Gen2	Configure PEG0 B0:D1:F0 Gen1-Gen3
PEG0 ASPM	Disabled **Auto** ASPM L0s ASPM L1 ASPM L0sL1	Control ASPM support for the PEG: Device 1 Function 0. This has no effect if PEG is not the currently active device.
Enable PEG	Disabled Enabled **Auto**	To enable or disable the PEG.
Fast PEG Init	**Enabled** Disabled	Enable or disable Fast PEG Init, Some optimization if not PEG devices present in cold boot.

10.3.2.4 Memory Configuration



Function	Selection	Description
DIMM profile	**Default DIMM profile** Custom Profile XMP Profile 1 XMP Profile 2	Select DIMM timing profile that should be used.
Memory Frequency Limiter	Auto 1067 1333 1600 1867 2133 2400 2667	Maximum Memory Frequency Selections in Mhz.
ECC Support	Disabled **Enabled**	Enable or disable DDR Ecc Support.
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 or disable memory remap above 4G.
Channel A DIMM Control	**Enable both DIMMs** Disable DIMM0 Disable DIMM1 Disable Both DIMMs	Enable or disable DIMMs on Channel A
Channel B DIMM Control	**Enable both DIMMs** Disable DIMM0 Disable DIMM1 Disable Both DIMMs	Enable or disable DIMMs on Channel B

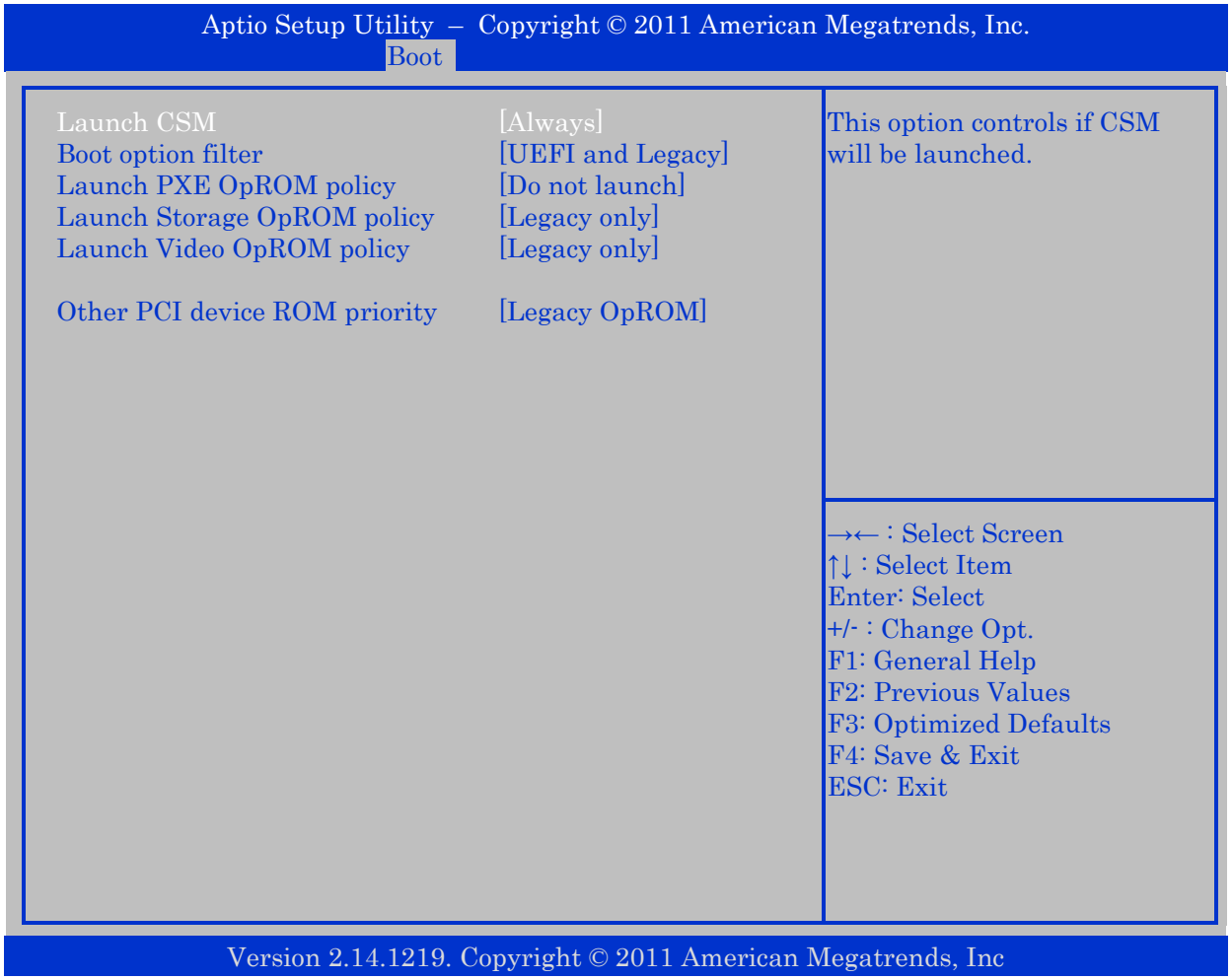
10.4 Boot


Aptio Setup Utility – Copyright © 2011 American Megatrends, Inc.
Main Advanced Chipset Boot Security Save & Exit
Boot Configuration
Setup Prompt Timeout 1
Bootup NumLock State [On]
Quit Boot [Disabled]
Fast Boot [Disabled]
CSM16 Module Version 07.69
GateA20 Active [Upon Request]
Option ROM Message [Force BIOS]
INT19 Trap Response [Immediate]
Boot Option Priorities
Boot Option #1 [P1: ST3120827AS ...]
► CSM parameters
Number of seconds to wait for setup activation key. 65535 (0xFFFF) means indefinite waiting.
→← : Select Screen
↑↓ : Select Item
Enter: Select
+/- : Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
Version 2.14.1219. Copyright © 2011 American Megatrends, Inc

Function	Selection	Description
Setup Prompt Timeout	**1**, 2 - 65535 (Note)	Number of seconds to wait for setup activation key. 65535 (0xFFFF) means indefinite waiting.
Bootup NumLock State	**On** Off	Select the Keyboard Numlock state.
Quit Boot	**Disabled** Enabled	Enables or disables Quiet Boot option.
Fast Boot	**Disabled** Enabled	Enables or disables boot with initialization of a minimal set of devices required to launch active boot option. Has no effect for BBS boot options.
GateA20 Active	**Upon Request** Always	Upon Request: GA20 can be disabled using BIOS services. Always: do not allow disabling GA20; this option is useful when any RT code is executed above 1MB.
Option ROM Message	**Force BIOS** Keep Current	Set display mode for Option ROM.
INT19 Trap Response	**Immediate** Postponed	BIOS reaction on INT19 trapping by Option ROM. Immediate: execute the trap right away. Postponed: execute the trap during legacy boot.
Boot Option #1	(list of bootable devices)	Sets the system boot order.

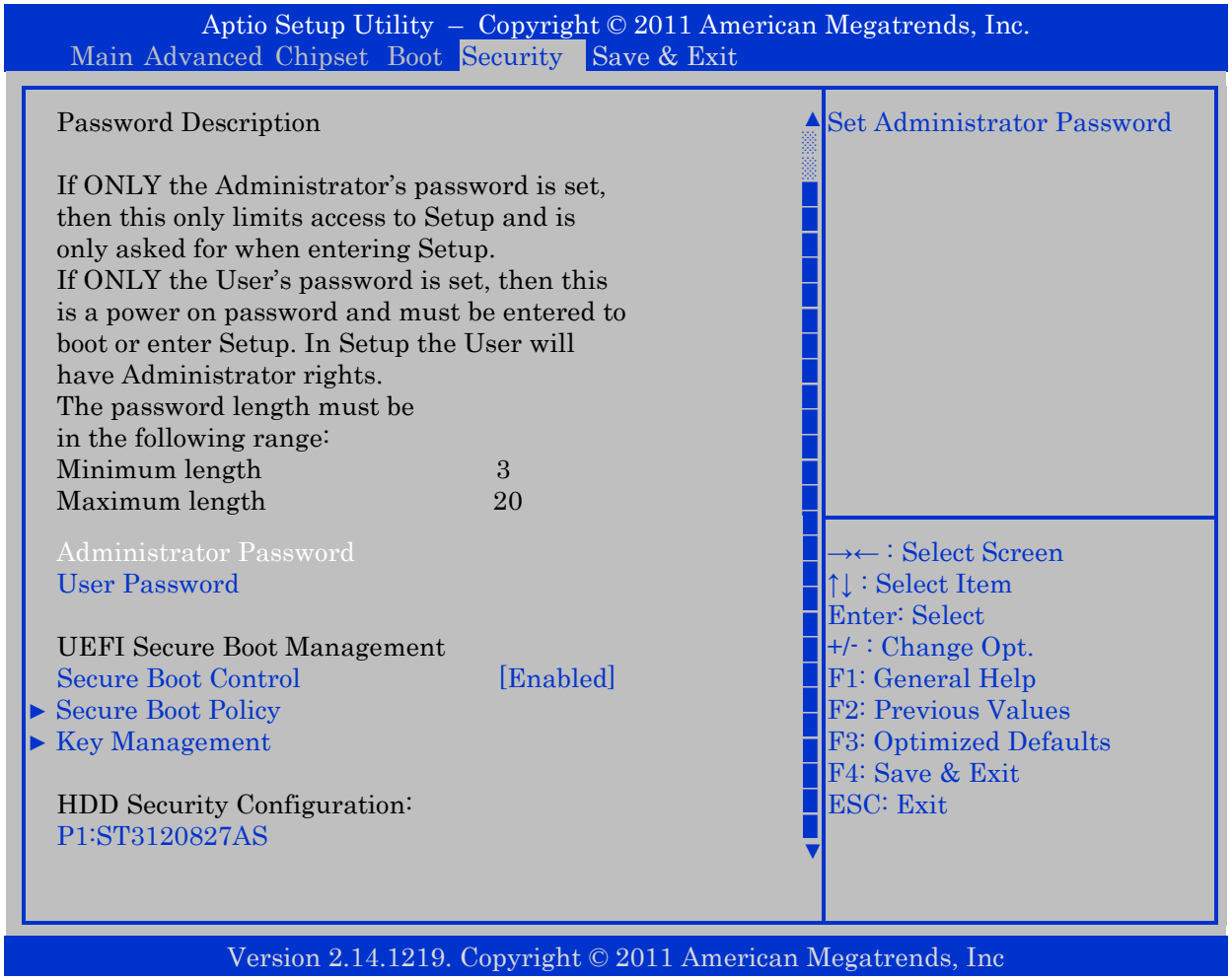
Note: To enter number use digit keys and/or +/- keys.

10.4.1 CSM parameters



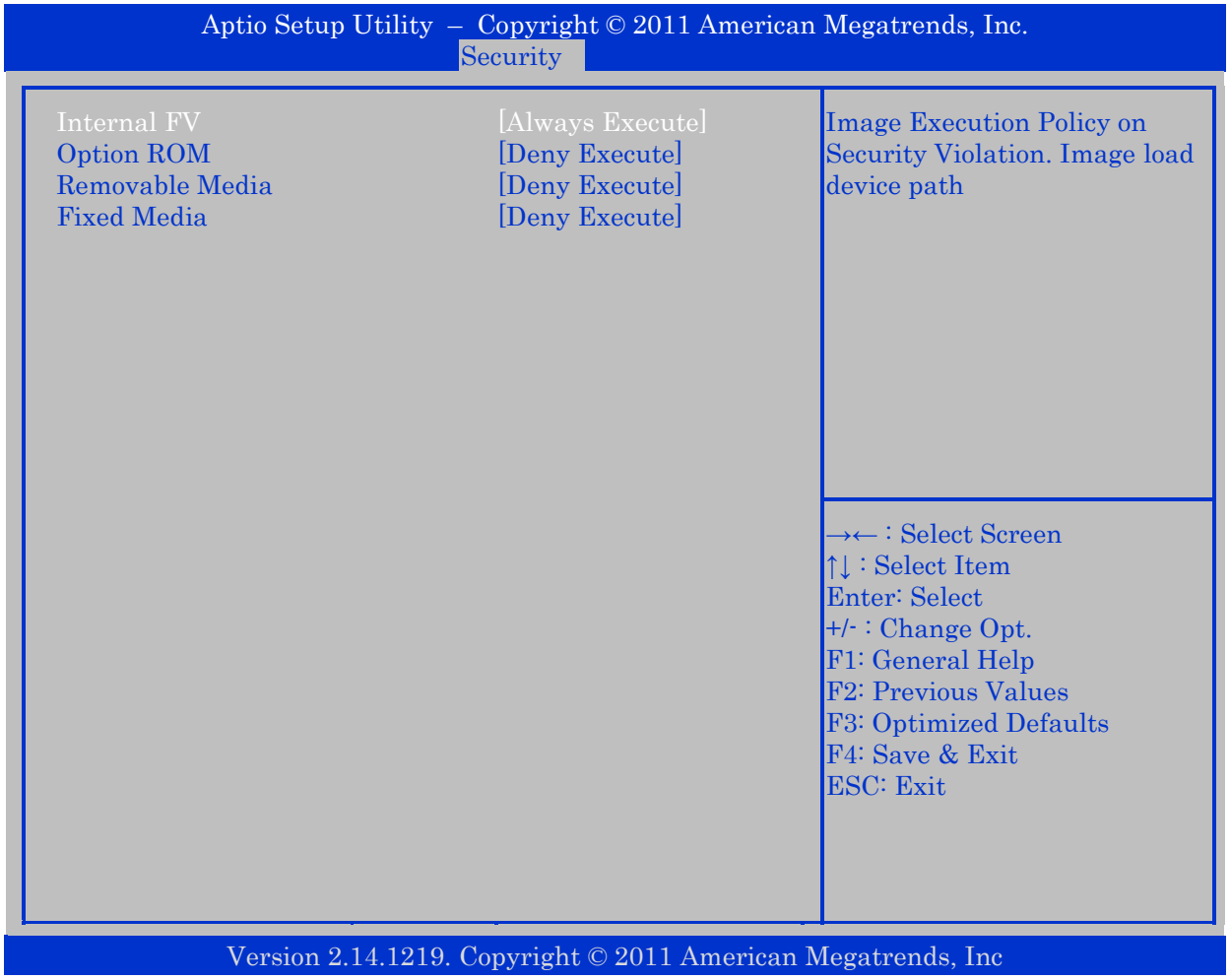
Function	Selection	Description
Launch CSM	Auto **Always** Never	This option controls if CSM will be launched.
Boot option filter	**UEFI and Legacy** Legacy only UEFI only	This option controls what devices system can boot to.
Launch PXE OpROM policy	**Do not launch** UEFI only Legacy only	Controls the execution of UEFI and Legacy PXE OpROM.
Launch Storage OpROM policy	Do not launch UEFI only **Legacy only**	Controls the execution of UEFI and Legacy Storage OpROM.
Launch Video OpROM policy	Do not launch UEFI only **Legacy only**	Controls the execution of UEFI and Legacy Video OpROM.
Other PCI device ROM priority	UEFI OpROM **Legacy OpROM**	For PCI devices other than Network, Mass storage or Video defines which OpROM to launch.

10.5 Security



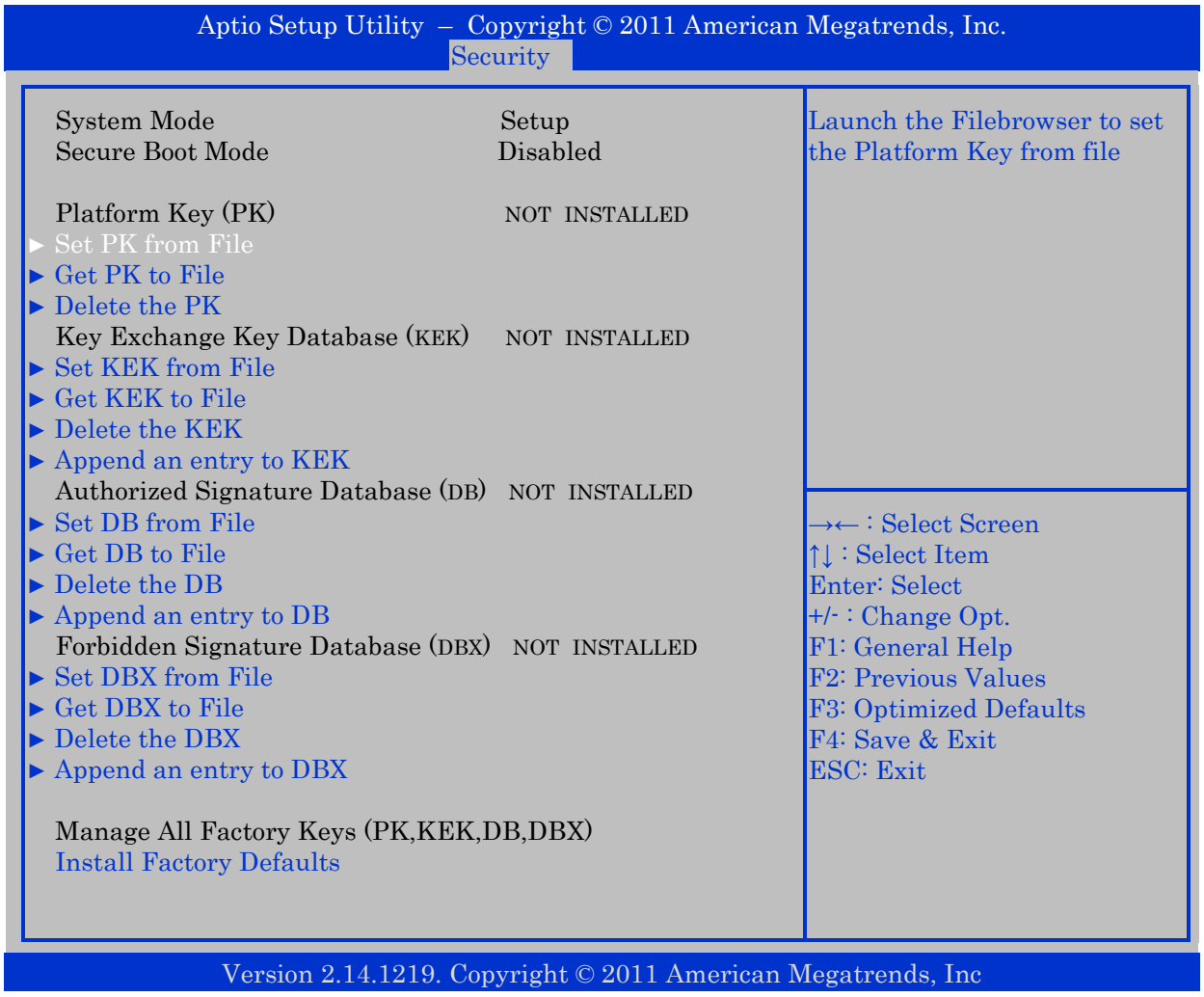
Function	Selection	Description
Administrator Password	(See Password description above)	Set Administrator Password
User Password	(See Password description above)	Set User Password
Secure Boot Control	**Enabled** Disabled	Secure Boot flow control. Secure Boot is possible only if System runs in User Mode.

10.5.1 Security Boot Policy



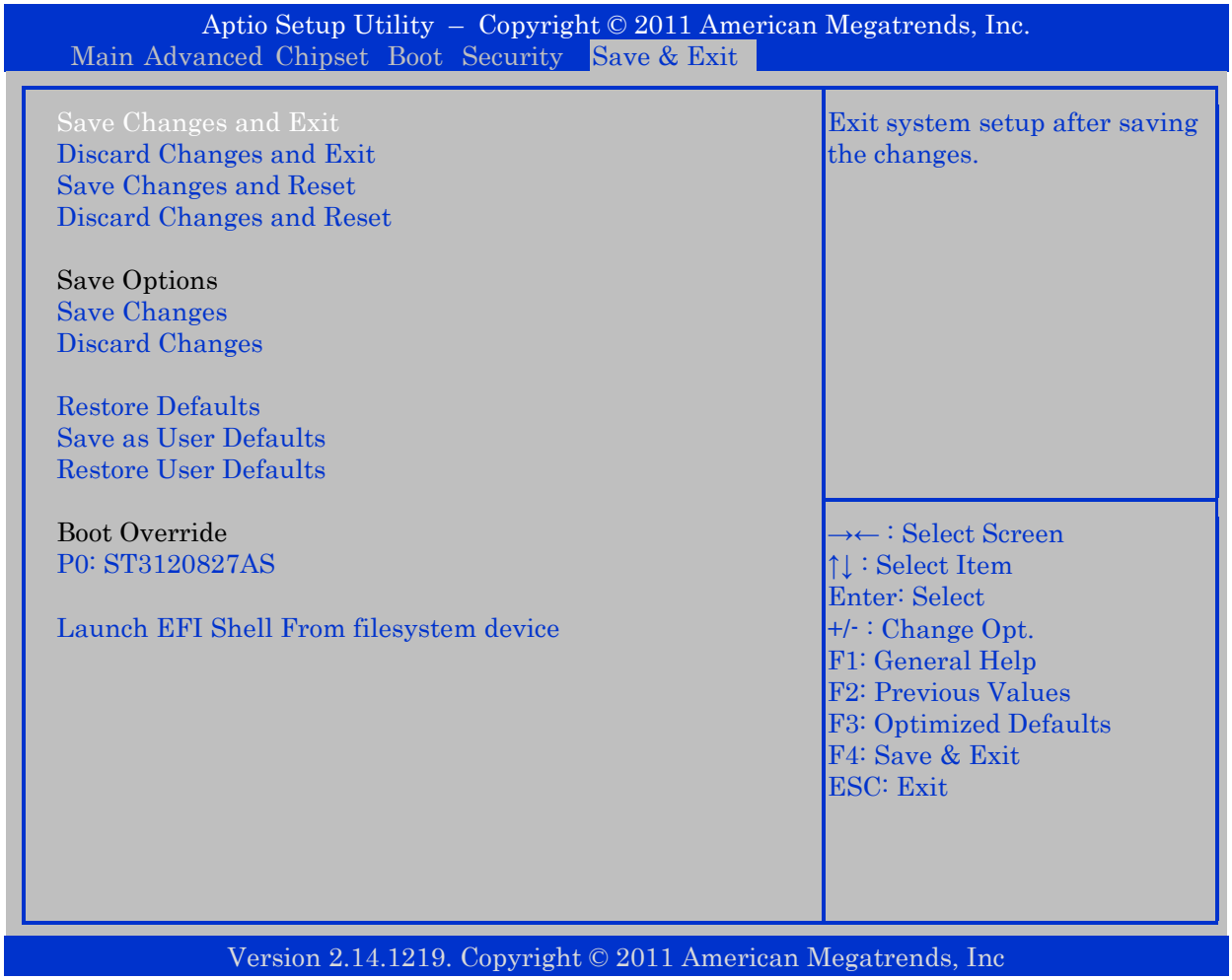
Function	Selection	Description
Internal FV	**Always Execute**	Image Execution Policy on Security Violation. Image load device path.
Option ROM	Always Execute Always Deny Allow Execute Defer Execute **Deny Execute** Query User	Image Execution Policy on Security Violation. Image load device path.
Removable Media	Always Execute Always Deny Allow Execute Defer Execute **Deny Execute** Query User	Image Execution Policy on Security Violation. Image load device path.
Fixed Media	Always Execute Always Deny Allow Execute Defer Execute **Deny Execute** Query User	Image Execution Policy on Security Violation. Image load device path.

10.5.2 Key Management



10.6 Save & Exit

This Menu is special; having no “selections” for each function, or in other words, the function is the same as the selection.



Function	Description
Save Changes and Exit	Exit system setup after saving the changes.
Discard Changes and Exit	Exit system setup without saving any changes.
Save Changes and Reset	Reset the system after saving the changes.
Discard Changes and Reset	Reset the system without saving any changes.
Save Changes	Save Changes done so far to any of the setup options.
Discard Changes	Discard Changes done so far to any of the setup options.
Restore Defaults	Restore/Load Default values for all the setup options.
Save as User Defaults	Save the Changes done so far as User Defaults.
Restore User Defaults	Restore the User Defaults to all the setup options.
(possible list of boot devices)	Selection table of bootable devices. When selected system will boot on selected device.
Launch EFI Shell From filesystem device	Attempts to Launch EFI Shell application (Shellx64.efi) from one of the available filesystem devices.

11 AMI BIOS Beep Codes

It is normal for Kontron AMI UEFI BIOS to generate some beeps after POST has passed successfully:
The first beep indicates that POST has successfully passed.
Then a number of beeps indicate the number of attached USB devices.
And finally a special long beep indicates that AMI boot is completed.
Note: The long beep starting as a normal beep but is changing to higher frequency.

If POST has found a problem, then the normal behaviour (described above) is changed:

Boot Block Beep Codes:

Number of Beeps	Description
1	Insert diskette in floppy drive A:
2	'AMIBOOT.ROM' file not found in root directory of diskette in A:
3	Base Memory error
4	Flash Programming successful
5	Floppy read error
6	Keyboard controller BAT command failed
7	No Flash EPROM detected
8	Floppy controller failure
9	Boot Block BIOS checksum error
10	Flash Erase error
11	Flash Program error
12	'AMIBOOT.ROM' file size error
13	BIOS ROM image mismatch (file layout does not match image present in flash device)

POST BIOS Beep Codes:

Number of Beeps	Description
1	Memory refresh timer error.
2	Parity error in base memory (first 64KB block)
3	Base memory read/write test error
4	Motherboard timer not operational
5	Processor error
6	8042 Gate A20 test error (cannot switch to protected mode)
7	General exception error (processor exception interrupt error)
8	Display memory error (system video adapter)
9	AMIBIOS ROM checksum error
10	CMOS shutdown register read/write error
11	Cache memory test failed

Troubleshooting POST BIOS Beep Codes:

Number of Beeps	Troubleshooting Action
1, 2 or 3	Reset the memory, or replace with known good modules.
4-7, 9-11	Fatal error indicating a serious problem with the system. Consult your system manufacturer. Before declaring the motherboard beyond "all hope", eliminate the possibility of interference due to a malfunctioning add-in card. Remove all expansion cards, except the video adapter. • If beep codes are generated when all other expansion cards are absent, consult your system manufacturer's technical support. • If beep codes are not generated when all other expansion cards are absent, one of the add-in cards is causing the malfunction. Insert the cards back into the system one at a time until the problem happens again. This will reveal the malfunctioning card.
8	If the system video adapter is an add-in card, replace or reset the video adapter. If the video adapter is an integrated part of the system board, the board may be faulty.

12 OS Setup

Use the Setup.exe files for all relevant drivers. The drivers can be found on KTQM67 Driver CD or they can be downloaded from the homepage http://www.kontron.com/