EmNANO-a56M0

COM Express® Mini CPU Module

User's Manual

Version 1.0

2013.11

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Revision History

Version	Release Time	Description
1.0	November 2013	Initial release

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Copyright Notice

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

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

Declaration of Conformity

CE

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

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

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

Warning

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

FCC Class B

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

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

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

NOTE:

This equipment has been tested and found to comply with the limits for a

Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio/TV technician for help

RoHS

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

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

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

SVHC / REACH

To minimize the environmental impact and take more responsibility to the earth we live, Arbor hereby confirms all products comply with the restriction of SVHC (Substances of Very High Concern) in (EC) 1907/2006 (REACH --Registration, Evaluation, Authorization, and Restriction of Chemicals) regulated by the European Union.

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

Warning

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

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

Replacing Lithium Battery

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

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

Do not throw lithium batteries into the trash-can. It must be disposed of in

accordance with local regulations concerning special waste.

Technical Support

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

http://www.arbor.com.tw

E-mail:info@arbor.com.tw

Warranty

This product is warranted to be in good working order for a period of two years from the date of purchase. Should this product fail to be in good working order at any time during this period, we will, at our option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster. Vendor assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, or inability to use this product. Vendor will not be liable for any claim made by any other related party.

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

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

Chapter 1

Introduction

1.1. Product Highlights

- Soldered onboard AMD G-Series SoC Dual Core 210HA processor
- Integrated Gigabit Ethernet
- Single Channel 18-bit LVDS and one DDI port
- Supporting dual independent displays
- Extended operating temp.: -20 ~ 70°C

1.2. About this Manual

This manual is intended for experienced users and integrators with hardware knowledge of computers. If you are not sure about the description in this manual, consult your vendor before further handling.

We recommend that you keep one copy of this manual for the quick reference for any necessary maintenance in the future. Thank you for choosing ARBOR products.

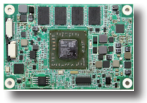
1.3. Specifications

Form Factor	COM Express® Mini Type 10 CPU Module
CPU	Soldered onboard AMD G-Series SoC Dual Core GX-210HA processor
System Memory	Soldered onboard 2GB DDR3L SDRAM
Audio	HD audio link
Ethernet	1 x Realtek RTL8111E PCIe GbE controller
BIOS	AMI BIOS, EFI core
Storage	2 x Serial ATA ports
USB Port	2 x USB 3.0 ports
	8 x USB 2.0 ports (two are shared with USB 3.0.)
Expansion Interface	3 x PCIe x1 lanes, LPC interface
	1 x SDIO port
Power Requirement	+5VSB, +12V
	BOM option for Power input 5V or 12V. (Default +12V, +5V is for OEM version)
Power States	Supports S0, S3, S4, S5

Operating Temp.	-20ºC ~ 70ºC (-4ºF ~ 158ºF)
Humidity	0 ~ 95% (non-condensing)
Watchdog Timer	1~127 levels reset
Dimension (L x W)	84 x 55 mm (3.30" x 2.16")

1.4. Inside the Package

Before starting to install the CPU board, make sure the following items are shipped:



One EmNANO-a56M0 COM Express® Mini CPU Module

One Driver CD

One Quick Installation Guide

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

1.5. Ordering Information

EmNANO-a56M0-210HA	COM Express® Mini Type 10 CPU Module w/ AMD G-Series SoC Dual Core GX-210HA and 2GB memory soldered on module
HS-56M0-F1	Heat spreader
HS-56M0-C1	Heat spreader with fan
PBN-9007	COM Express® Mini evaluation carrier board (EPIC form factor)
CBK-05-9007-00	Cable Kit 1 x USB cable 1 x COM-port cable 1 x SATA cable 1 x SATA power cable 1 x PS/2 cable

Chapter 2

Getting Started

2.1. What is "COM Express®"?

With more and more demands on small and embedded industrial boards, a multi-functional COM (Computer-on-Module) surfaces as a great solution. The COM Express® comes with two 220-pin rows of connectors for board-to-board connection.

Row AB, which is required, provides pins for PCI Express, SATA, LVDS, LCD channel, LPC bus, system and power management, VGA, LAN, and power and ground interfaces.

Row CD, which is optional, provides SDVO and legacy PCI and IDE signals next to additional PCI Express, LAN and power and ground signals. (Note: EmNANO-a56M0 is a COM Express® Mini Type 10 pin module that has no row CD.)

The COM targets the following applications:

- Retail & Advertising
- Medical
- Test & Measurement
- Gaming & Entertainment
- Industrial & Automation
- Military & Government
- Security

COM Express supports seven pin-out “Types” applying to Basic and Extended form factors:

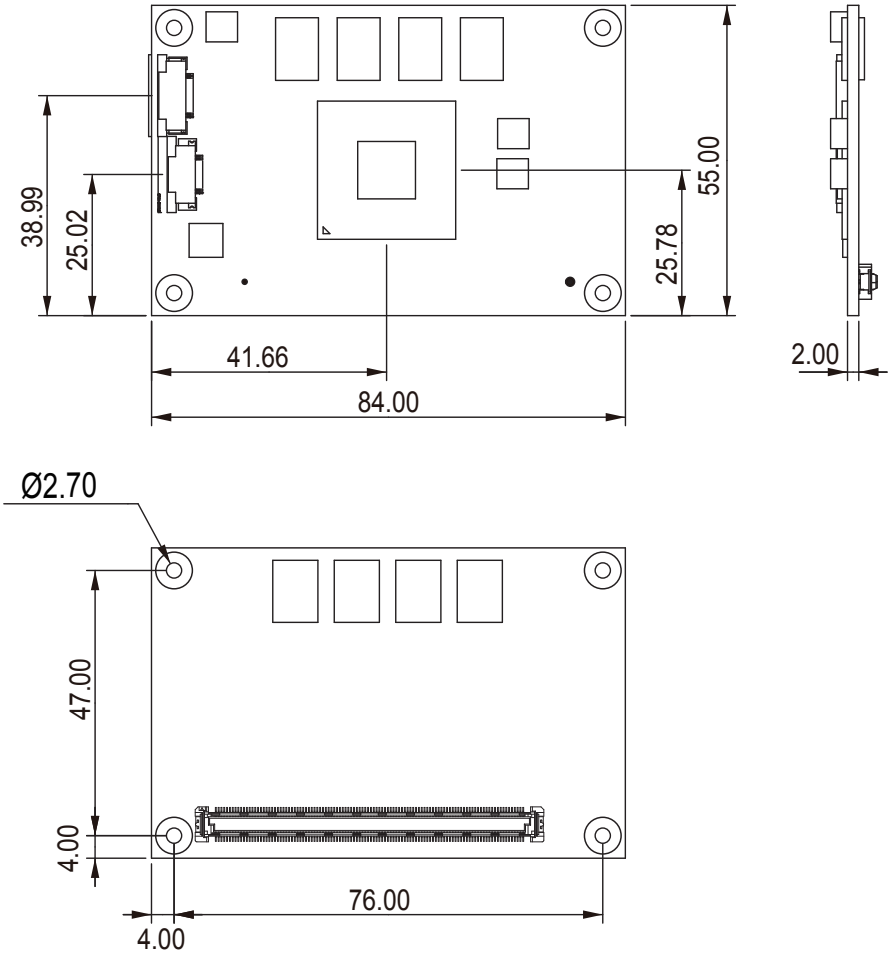
- Module Type 1 and 10 support single connector with two rows of pins (220 pins).
- Module Type 2, 3, 4, 5 and 6 support two connectors with four rows of pins (440 pins).

EmNANO-a56M0 is a COM Express® Mini Type 10 pin module that targets the battery-powered and mobile handheld systems designs. The new Ultra size form factor with a footprint of just 55 mm x 84 mm is the smallest size in ARBOR’s COM Express® product lineup, next to the Basic size (125 mm x 95 mm) and Compact size (95mm x 95mm) form factors.

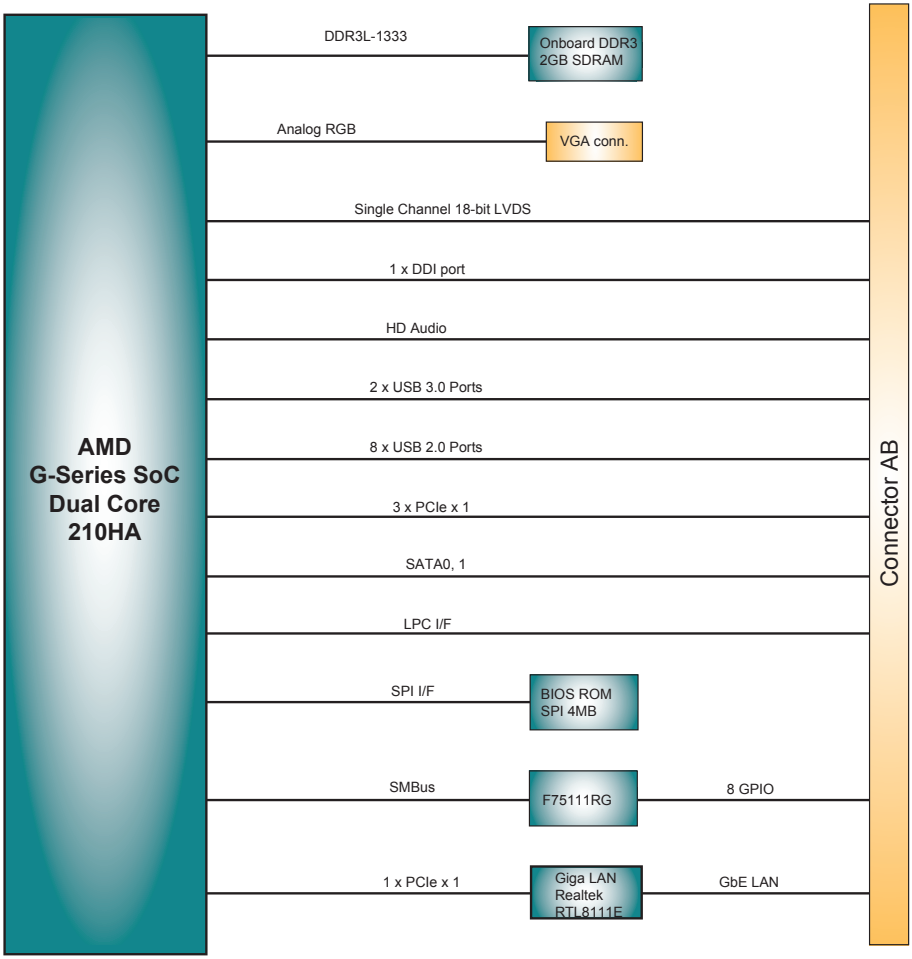
The connector difference between Standard type 10 and EmNANO-a56M0 is tabulated as below:

Module Type	Type 10	EmNANO-a56M0
Connectors	1	1
Connector Rows	A, B	A, B
PCIe Lanes (max)	4	3
LAN (Max)	1	1
Serial Ports (Max)	2	No
DDI0 (Max)	1	1
LVDS Channel A	1	1
USB 2.0 Ports (Max)	8	8
USB 3.0 Ports (Max)	2	2

2.2. Board Dimensions

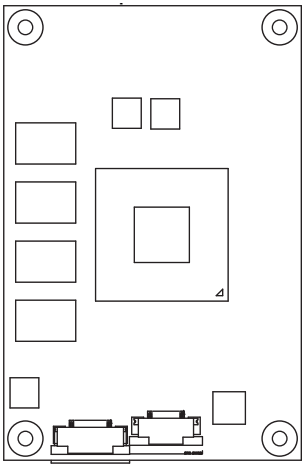


2.3. Block Diagram



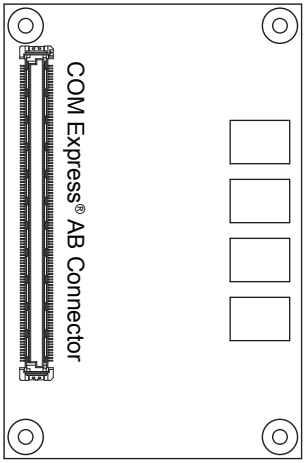
2.4. Connectors

Top Side



Bottom Side

(w/ COM Express® AB connector)



2.5. Pin Definition - AB Connector

Note: A pin with a remark “(N/C)“ is a pin that the signal isn’t available on this board while the remark beyond the bracket delivers the consortium-specified definition.

B1	GND	GND	A1
B2	GBE0_ACT#	GBE0_MDI3-	A2
B3	LPC_FRAME#	GBE0_MDI3+	A3
B4	LPC_AD0	GBE0_LINK100#	A4
B5	LPC_AD1	GBE0_LINK1000#	A5
B6	LPC_AD2	GBE0_MDI2-	A6
B7	LPC_AD3	GBE0_MDI2+	A7
B8	LPC_DRQ0#	GBE0_LINK# (N/C)	A8
B9	LPC_DRQ1# (N/C)	GBE0_MDI1-	A9
B10	LPC_CLK	GBE0_MDI1+	A10
B11	GND	GND	A11
B12	PWRBTN#	GBE0_MDI0-	A12
B13	SMB_CK	GBE0_MDI0+	A13
B14	SMB_DAT	GBE0_CTREF (N/C)	A14
B15	SMB_ALERT#	SUS_S3#	A15
B16	SATA1_TX+	SATA0_TX+	A16
B17	SATA1_TX-	SATA0_TX-	A17
B18	SUS_STAT#	SUS_S4#	A18
B19	SATA1_RX+	SATA0_RX+	A19
B20	SATA1_RX-	SATA0_RX-	A20
B21	GND	GND	A21
B22	USB_SSRX0-	USB_SSRX0-	A22
B23	USB_SSRX0+	USB_SSRX0+	A23
B24	SUS_S5#	SUS_S5#	A24
B25	USB_SSRX1-	USB_SSRX1-	A25
B26	USB_SSRX1+	USB_SSRX1+	A26
B27	WDT	BATLOW#	A27
B28	AC_SDIN2	ATA_ACT#	A28
B29	AC_SDIN1	AC_SYNC	A29
B30	AC_SDIN0	AC_RST#	A30
B31	GND	GND	A31
B32	SPKR	AC_BITCLK	A32
B33	I2C_CK (N/C)	AC_SDOUT	A33
B34	I2C_DAT (N/C)	BIOS_DIS0#	A34
B35	THRM#	THRMTRIP#	A35
B36	USB7-	USB6-	A36
B37	USB7+	USB6+	A37
B38	USB_4_5_OC#	USB_6_7_OC#	A38
B39	USB5-	USB4-	A39
B40	USB5+	USB4+	A40
B41	GND	GND	A41
B42	USB3-	USB2-	A42
B43	USB3+	USB2+	A43
B44	USB_0_1_OC#	USB_2_3_OC#	A44
B45	USB1-	USB0-	A45
B46	USB1+	USB0+	A46
B47	EXCD1_PERST#	VCC_RTC (N/C)	A47
B48	EXCD1_CPPE#	EXCD0_PERST#	A48
B49	SYS_RESET#	EXCD0_CPPE#	A49
B50	CB_RESET#	LPC_SERIRQ	A50
B51	GND	GND	A51
B52	RSVD (N/C)	RSVD (N/C)	A52
B53	RSVD (N/C)	RSVD (N/C)	A53
B54	GPO1	GPI0	A54
B55	RSVD (N/C)	RSVD (N/C)	A55

B56	RSVD (N/C)	RSVD (N/C)	A56
B57	GPO2	GND	A57
B58	PCIE_RX3+ (N/C)	PCIE_TX3+ (N/C)	A58
B59	PCIE_RX3- (N/C)	PCIE_TX3- (N/C)	A59
B60	GND	GND	A60
B61	PCIE_RX2+	PCIE_TX2+	A61
B62	PCIE_RX2-	PCIE_TX2-	A62
B63	GPO3	GPI1	A63
B64	PCIE_RX1+	PCIE_TX1+	A64
B65	PCIE_RX1-	PCIE_TX1-	A65
B66	WAKE0#	GND	A66
B67	WAKE1#	GPI2	A67
B68	PCIE_RX0+	PCIE_TX0+	A68
B69	PCIE_RX0-	PCIE_TX0-	A69
B70	GND	GND	A70
B71	DDI0_TX0_DP	LVDS_A0+	A71
B72	DDI0_TX0_DN	LVDS_A0-	A72
B73	DDI0_TX1_DP	LVDS_A1+	A73
B74	DDI0_TX1_DN	LVDS_A1-	A74
B75	DDI0_TX2_DP	LVDS_A2+	A75
B76	DDI0_TX2_DN	LVDS_A2-	A76
B77	DDI0_PAIR4+ (N/C)	LVDS_VDD_EN	A77
B78	DDI0_PAIR4- (N/C)	LVDS_A3+ (N/C)	A78
B79	LVDS_BKLT_EN	LVDS_A3- (N/C)	A79
B80	GND	GND	A80
B81	DDI0_TX3_DP	LVDS_A_CK+	A81
B82	DDI0_TX3_DN	LVDS_A_CK-	A82
B83	CKLVDS_BKLT_CTRL	LVDS_I2C_CLK	A83
B84	VCC_5V_SBY	LVDS_I2C_DAT	A84
B85	VCC_5V_SBY	GPI3	A85
B86	VCC_5V_SBY	KBRST (N/C)	A86
B87	VCC_5V_SBY	KBD_A20GATE (NC)	A87
B88	BIOS_DIS1#	PCIE0_CK_REF+	A88
B89	DDI0_HPD	PCIE0_CK_REF-	A89
B90	GND	GND	A90
B91	DDI0_PAIR5+ (N/C)	SPI_POWER	A91
B92	DDI0_PAIR5- (N/C)	SPI_MSIO	A92
B93	DDI0_PAIR6+ (N/C)	GPIO4	A93
B94	DDI0_PAIR6- (N/C)	SPI_CKL	A94
B95	DDI0_DDC_AUX_SEL	SPI_MOSI	A95
B96	USB_HOST_PRSNT (N/C)	TPM_PP (N/C)	A96
B97	SPI_CS#	TYPE10#	A97
B98	DDI0_CTRLCLK_AUX+	SER0_TX (N/C)	A98
B99	DDI0_CTRLCLK_AUX-	SER0_RX (N/C)	A99
B100	GND	GND	A100
B101	N/C	SER1_TX (N/C)	A101
B102	N/C	SER1_RX (N/C)	A102
B103	SLEEP#	LID#	A103
B104	VCC_12V	VCC_12V	A104
B105	VCC_12V	VCC_12V	A105
B106	VCC_12V	VCC_12V	A106
B107	VCC_12V	VCC_12V	A107
B108	VCC_12V	VCC_12V	A108
B109	VCC_12V	VCC_12V	A109
B110	GND	GND	A110

2.6. Find Device Drivers on CD

EmNANO-a56M0 supports **Windows 7** and **Windows 8**. Find device drivers on the CD that comes with your purchase:

Windows 7

Device	Driver Path
Audio	\EmNANO-a56M0\AUDIO\32bit
	\EmNANO-a56M0\AUDIO\64bit
LAN	\EmNANO-a56M0\LAN\Win7\Install_Win7_7061_07272012
USB 3.0	\EmNANO-a56M0\USB_3.0\win7 * This driver is provided in the format of an executable file. To install this driver: 1. Enable the board's USB3.0 feature in the BIOS Setup utility. 2. Boot up the system into the operating system, Windows 7. 3. Open the operating system's **Device Manager**. 4. Right-click the USB device that shows a question mark on it. 5. Click **Update Driver** from the context menu that opens. 6. Browse where the driver is, i.e. the aforelisted path. 7. Follow the onscreen instructions to install the driver.
VGA	\EmNANO-a56M0\VGA\win7_win8_32_64

Windows 8

Device	Driver Path
Audio	\EmNANO-a56M0\AUDIO\32bit
	\EmNANO-a56M0\AUDIO\64bit
LAN	\EmNANO-a56M0\LAN\Win8\Install_Win8_8015_05242013
VGA	\EmNANO-a56M0\VGA\win7_win8_32_64
USB 3.0	*USB3.0 needs no driver to work in Windows 8.

Chapter 3

BIOS

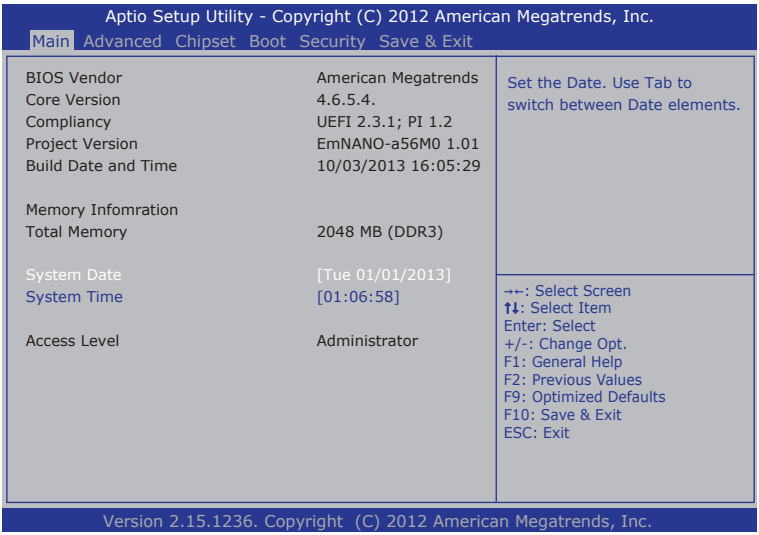
The BIOS Setup utility for EmNANO-a56M0 is featured by American Megatrends Inc to configure the system settings stored in the systems' BIOS ROM. The BIOS is activated once the system powers on.

To access BIOS settings, have a LCD monitor and follow the guide below:

1. Connect the EmNANO-a56M0 to a computer.
2. Turn on the LCD monitor.
3. Supply power to the EmNANO-a56M0.
4. Continuously hit the **Delete** key when "**Press DEL to run Setup**" is prompted onscreen.

Note: If **Quick Boot** is enabled, the prompt **Press DEL to run Setup** won't show. If this is the case, continuously press the **Delete** key once the computer powers on to enter the BIOS Setup.

Normally the **Main** menu shows once the BIOS Setup utility opens. Whatever menu or submenu is selected thereafter, it is presented in two panes onscreen. The left pane displays all the settings that are accessible to users while the right pane shows the setting direction. Each menu offers some settings. When a setting is selected on the left pane, it becomes highlighted in white. Settings are enclosed within brackets while the non-setting are presented in gray. The default settings are presented in bold.



NOTE: For system stability and performance, this BIOS is constantly improved by the manufacturer of the CPU board. Hence the screenshots and descriptions hereinafter in this manual are for reference only and may not exactly meet what is seen onscreen.

The BIOS Setup utility features 6 menus:

Menu	Description
Main	See 3.1. Main on page 16.
Advanced	See 3.2. Advanced Settings on page 17.
Chipset	See 3.3. Chipset on page 32.
Boot	See 3.4. Boot on page 41.
Security	See 3.5. Security on page 43.
Save & Exit	See 3.6. Save & Exit on page 44.

3.1. Main

The **Main** menu displays some BIOS info and features the settings of **System Date** and **System Time**.

The displayed info is:

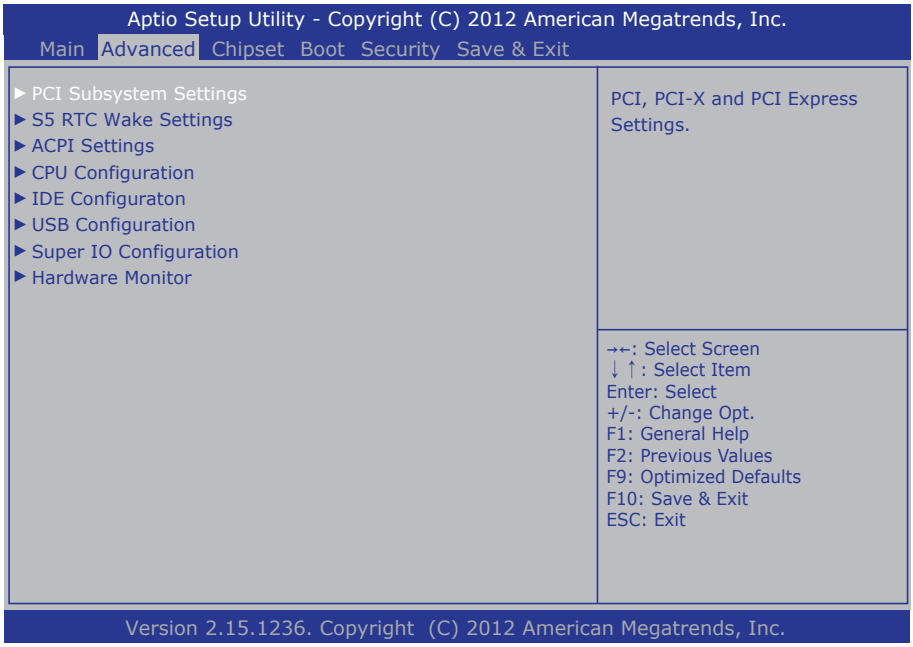
Info Item	Description
BIOS Vendor	Delivers the provider of the BIOS Setup utility.
Core Version	Delivers the version of the core.
Compliancy	Delivers the UEFI support.
Project Version	Delivers the board's BIOS version.
Build Date and Time	Delivers the date and time the BIOS Setup utility was made/updated.
Access Level	Delivers the level by which the BIOS Setup utility is being accessed at the moment.

The featured settings are:

Setting	Description
System Date	Sets system date.
System Time	Sets system time.

3.2. Advanced Settings

Access **Advanced** menu to configures the board's Super IO chip to control the power interface, CPU, IDE, USB interface and to manage the supports for some legacy devices.

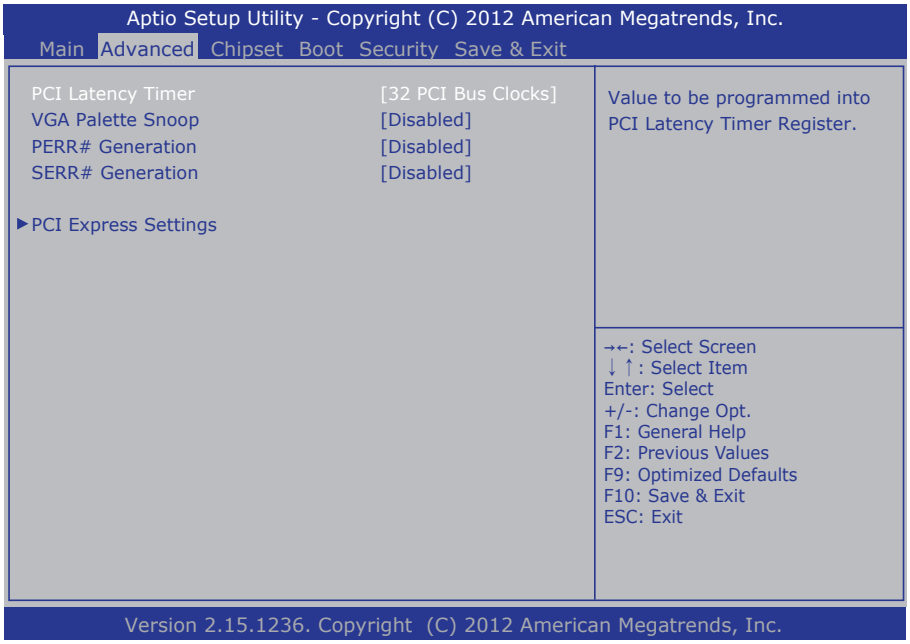


The featured settings and submenus are:

Setting	Description
PCI Subsystem Settings	See 3.2.1. PCI Subsystem Settings on page 18.
S5 RTC Wake Settings	See 3.2.2. S5 RTC Wake Settings on page 21.
ACPI Settings	See 3.2.3. ACPI Settings on page 23.
CPU Configuration	See 3.2.4. CPU Configuration on page 24.
IDE Configuration	See 3.2.5. IDE Configuration on page 26.
USB Configuration	See 3.2.6. USB Configuration on page 27.
Super IO Configuration	See 3.2.7. Super IO Configuration on page 29.
Hardware Monitor	See 3.2.8. Hardware Monitor on page 31.

3.2.1. PCI Subsystem Settings

Access this submenu to control the system's PCI, PCI-X and PCI Express features.



The featured settings are:

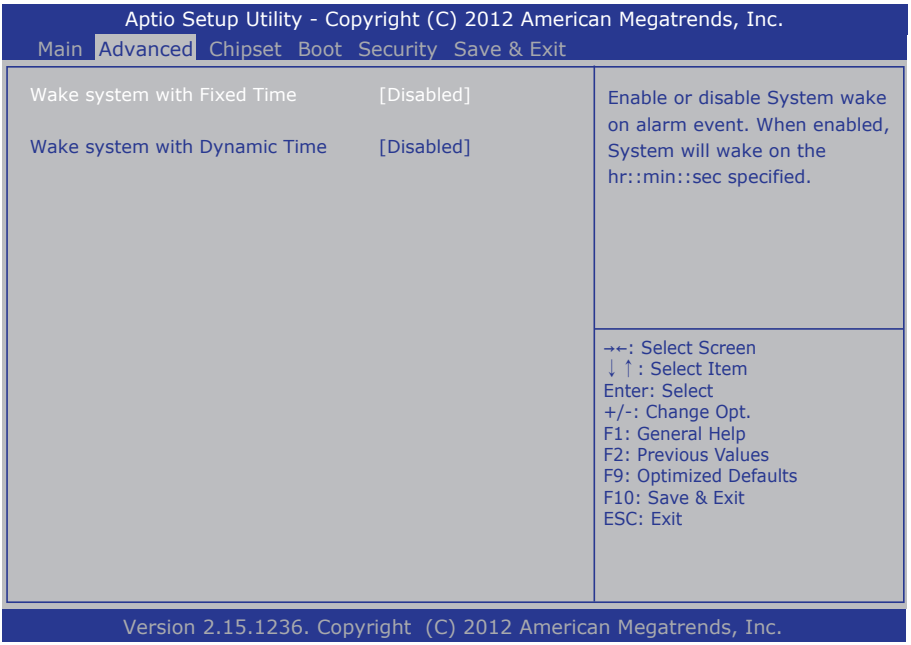
Setting	Description
PCI Latency Timer	Configures the value to be programmed into PCI Latency Timer register. ▸ Options available are **32 PCI Bus Clocks** (default) **64 PCI Bus Clocks** **96 PCI Bus Clocks** **128 PCI Bus Clocks** **160 PCI Bus Clocks** **192 PCI Bus Clocks** **224 PCI Bus Clocks** **248 PCI Bus Clocks**
VGA Palette Snoop	Enables/disables VGA palette registers snooping. ▸ **Disabled** is the default.
PERR# Generation	Enables/disables PCI device to/from generating PERR# signal. ▸ **Disabled** is the default.

<table>
<tr><td>SERR# Generation</td><td>Enables/disables PCI device to/from generating SERR# signal.
▸ Disabled is the default.</td></tr>
<tr><td>PCI Express Settings</td><td>Configures PCI Express features by the following settings:
<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>Relaxed Ordering</td><td>Enables/disables PCI Express device “relaxed ordering”.
▸ Disabled is the default.</td></tr>
<tr><td>Extended Tag</td><td>Enables/disables the PCI Express device to/from using 8-bit tag field as a requester.
▸ Disabled is the default.</td></tr>
<tr><td>No Snoop</td><td>Enables/disables PCI Express device “no snoop” option.
▸ Enabled is the default.</td></tr>
<tr><td>Maximum Payload</td><td>Configures the maximum payload for the PCI Express device or leaves it on BIOS configuration.
▸ Options available are Auto (default)
128 Bytes
256 Bytes
512 Bytes
1024 Bytes
2048 Bytes
4096 Bytes</td></tr>
<tr><td>Maximum Read Request</td><td>Configures the maximum read request size for the PCI Express device or leaves it on BIOS configuration.
▸ Options available are Auto (default)
128 Bytes
256 Bytes
512 Bytes
1024 Bytes
2048 Bytes
4096 Bytes</td></tr>
<tr><td>Extended Synch</td><td>Enables/disables the generation of “extended synchronization patterns”.
▸ Disabled is the default.</td></tr>
<tr><td>Link Training Retry</td><td>Defines how many times for the software to retain the link for if the previous training attempt is unsuccessful.
▸ Options available are Disabled (default), 2, 3 and 5.</td></tr>
<tr><td>Link Training Timeout (uS)</td><td>Defines how long for the software to wait for before it polls the “Link Training” bit in the link status register.
▸ 10 to 10000 uS are configurable.</td></tr>
</table></td></tr>
</table>

	Unpopulated Links	Enables/disables the software to/from disabling unpopulated PCI Express links in order to save power. ▸ Options available are **Keep Link On** (default) and **Disabled.**
	Restore PCIE Registers	Enables/disables the restoration of PCI Express device configurations on S3 resume. ▸ **Disabled** is the default. ▸ WARNING: Enabling this may cause issues with other hardware after S3 resume.

3.2.2. S5 RTC Wake Settings

Access this submenu to control whether the system can wake from S5 using the RTC alarm.



The featured settings are:

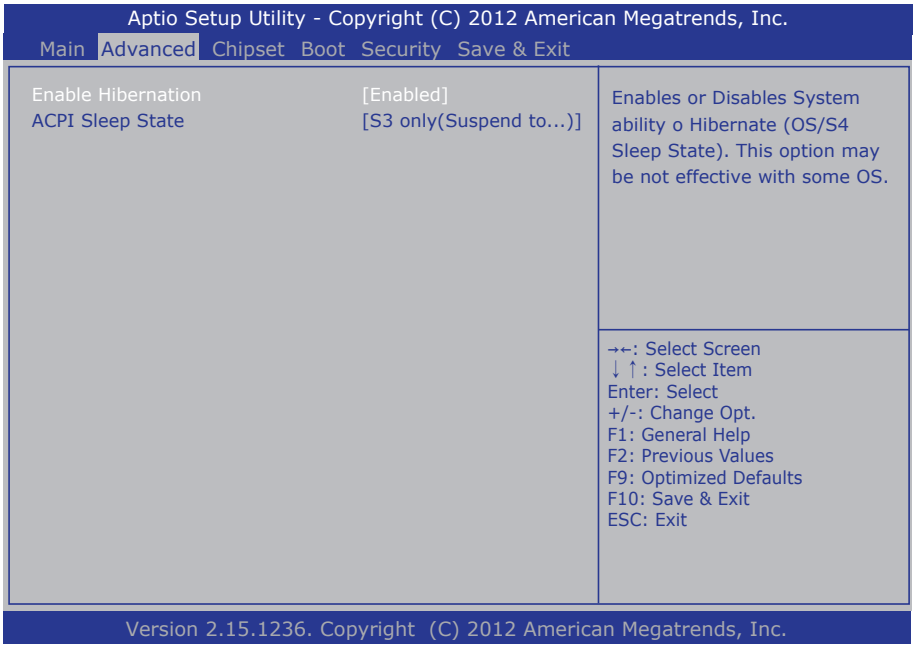
Setting	Description
Wake system with Fixed Time	Enables/disables the system to wake up on a specified time. ▸ **Disabled** is the default. ▸ When enabled, the following settings become available:

Setting	Description
Wake up hour	Defines the (hour) time to wake up the system. ▸ 0 to 23 configurable.
Wake up minute	Defines the (minute) time to wake up the system. ▸ 0 to 59 configurable.
Wake up second	Defines the (second) time to wake up the system. ▸ 0 to 59 configurable.

<table>
<tr>
<td>Wake system with Dynamic Time</td>
<td>Sets if to awake the system some time in the future.
▸ Options available are Enabled and Disabled (default).
▸ Enable this feature to awake the system some time from now. When enabled, the following setting becomes available:
<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>Wake up minute increase</td><td>Defines how long from now to awake the system.
▸ 1 to 5 minutes configurable.</td></tr>
</table>
</td>
</tr>
</table>

3.2.3. ACPI Settings

Access this submenu to enable users to change the system's ACPI (Advanced Configuration and Power Interface) configuration.

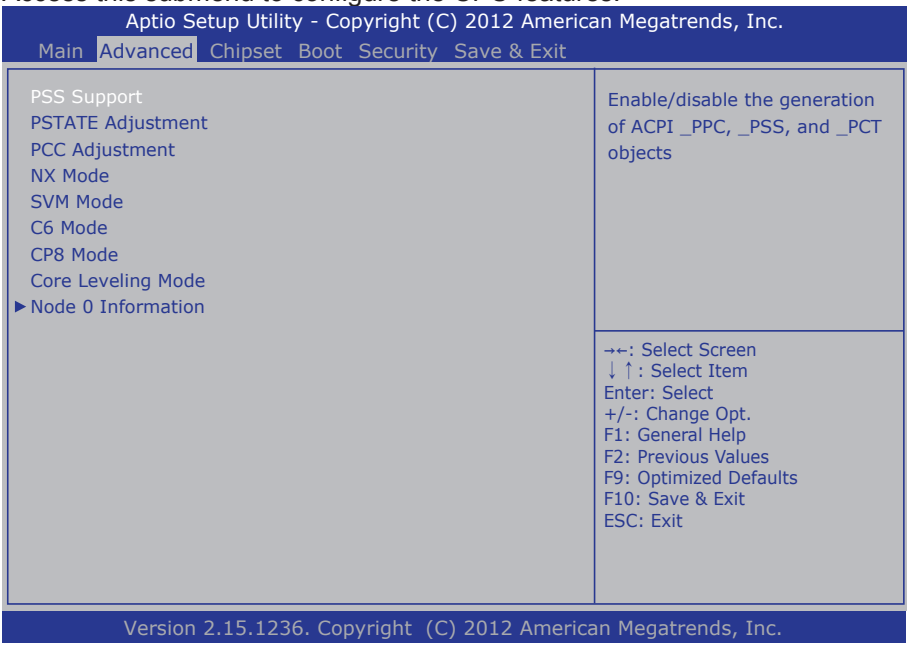


The featured settings are:

Setting	Description
Enable Hibernation	Enables/disables the system to/from hibernation (OS/S4 Sleep State). ▸ This option may not be effective with some OS. ▸ **Enabled** is the default.
ACPI Sleep State	Sets the highest ACPI sleep state that system enters when the suspend button is hit. ▸ Only one option is available: **S3 (Suspend to RAM)**.

3.2.4. CPU Configuration

Access this submenu to configure the CPU features.



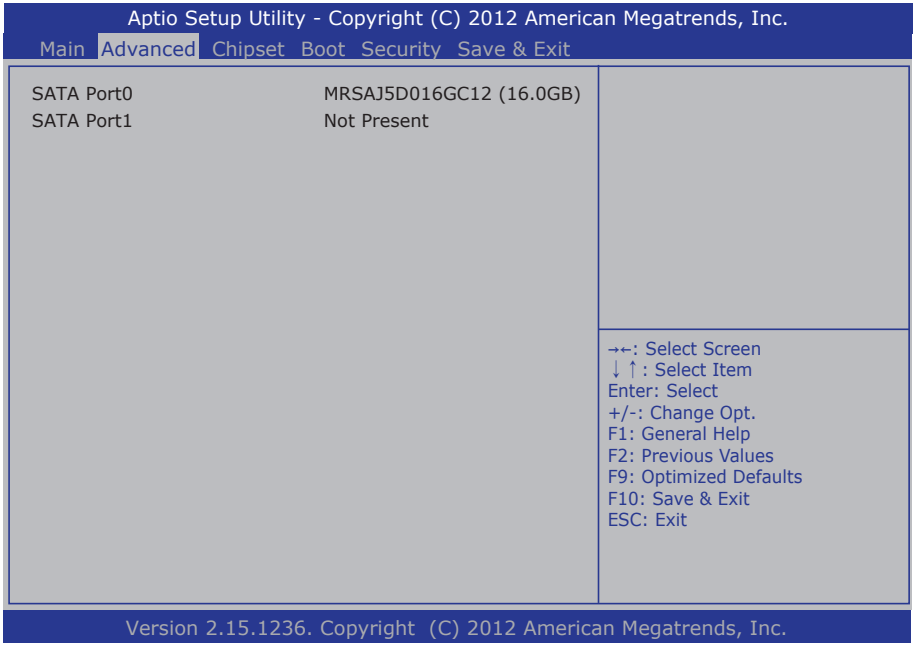
The featured settings are:

Setting	Description
PSS Support	Enables/disables the generation of the ACPI objects including _PPC, _PSS, and _PCT. ▸ **Enabled** is the default.
PSTATE Adjustment	Configures the startup P-state level, i.e. the speed at which the processor handles itself to conserve power during usage or to operate at the top speeds available (while consuming more power). ▸ Options available are: **PState 0** (default) **PState 1** **PState 2** **PState 3** **PState 4** **PState 5** **PState 6** **PState 7** ▸ "P-states" are processor's "performance states" which mean the multiple frequency and voltage points for the optimal performance and power efficiency.

PPC Adjustment	Configures the _PPC object. ▸ "PPC means "Performance Present Capabilities", an optional method that returns a list of the performance states currently supported by the platform. ▸ Options available are: **PState 0** (default; CPU clock frequency: 1000 MHz) **PState 1** (CPU clock frequency: 900 MHz) **PState 2** (CPU clock frequency: 800 MHz)
NX Mode	Enables/disables "no-execute page protection". ▸ **Enabled** is the default. ▸ "NX" means "no execute".
SVM Mode	Enables/disables CPU virtualization. ▸ **Enabled** is the default.
C6 Mode	Enables/disables C6 sleep state. ▸ **Disabled** is the default.
CPB Mode	Disables CP8, or leaves it on BIOS auto-configuration. ▸ **Automatic mode** .is the default.
Core Leveling Mode	Changes the number of cores in the system. ▸ **Automatic mode** ▸ **Three cores per processor** ▸ **Two cores per processor** ▸ **One core per processor**
Node 0 Information	Views the memory information related to the CPU.

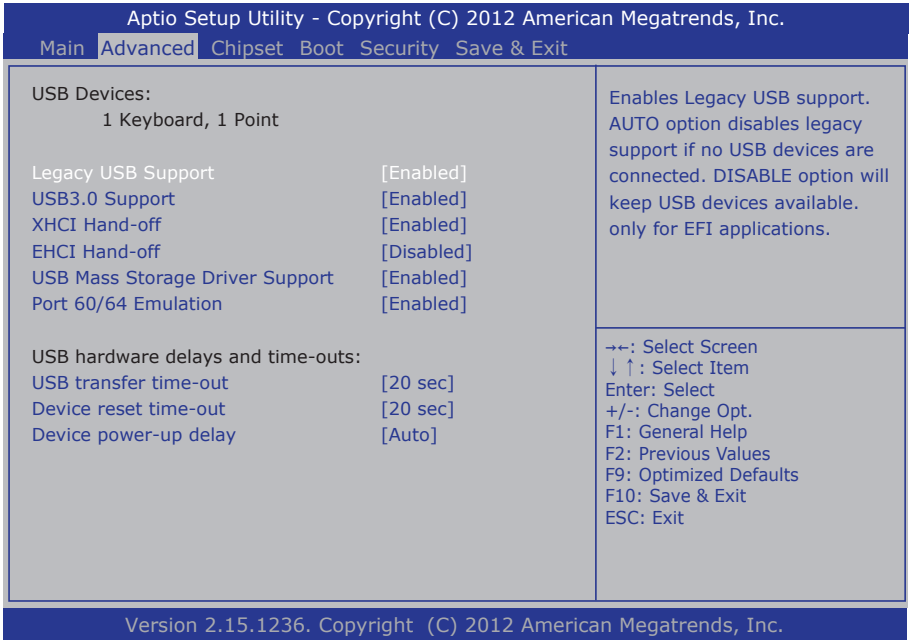
3.2.5. IDE Configuration

Access this submenu to view the presence of SATA device(s).



3.2.6. USB Configuration

Select this submenu to view the status of the USB ports and configure USB features.



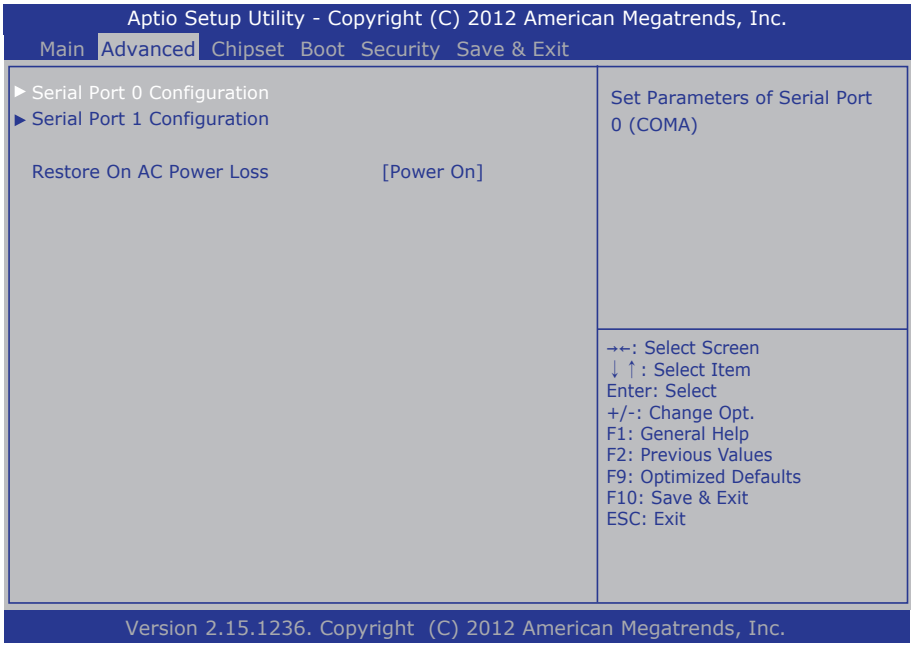
The featured settings and delivered info are:

Group	Setting / Info	Description
USB Configuration	**Legacy USB Support**	Enables/disables legacy USB support. ▸ Options available are **Enabled** (default), **Disabled** and **Auto**. ▸ Select **Auto** to disable legacy support if no USB device are connected. ▸ Select **Disabled** to keep USB devices available only for EFI applications.
	USB3.0 Support	Enables/disables USB3.0 (XHCI) controller support. ▸ **Enabled** is the default.
	XHCI Hand-off	Enables/disables a workaround for the operating systems that have no XHCI hand-off support ▸ **Enabled** is the default.

	EHCI Hand-off	Enables/disables a workaround for the operating systems that have no EHCI hand-off support ▸ **Disabled** is the default.
	USB Mass Storage Driver Support	Enables/disables the support for USB mass storage driver. ▸ **Enabled** is the default.
	Port 60/64 Emulation	Enables/disables the I/O port 60h/64h emulation support. ▸ **Enabled** is the default. ▸ Leave it as **Enabled** to enable the complete USB keyboard legacy support for the operating systems that are not aware of USB.
USB hardware delays and time-outs	**USB transfer time-out**	Sets the time-out for USB control/bulk/interrupt transfers. ▸ Options available are **1 sec**, **5 sec**, **10 sec** and **20 sec** (default).
	Device reset time-out	Sets the time-out for USB mass storage device start unit command. ▸ Options available are **10 sec**, **20 sec** (default), **30 sec** and **40 sec**.
	Device power-up delay	Sets the maximum time that elapses before a USB device reports itself to the controller. ▸ Select **Auto** (default) to apply a 100 ms delay to the root port and make the hub port use the delay from Hub descriptor. ▸ Select **Manual** to customize a delay from 1 to 40 seconds.

3.2.7. Super IO Configuration

Access this submenu to configure the system's Super IO chip.



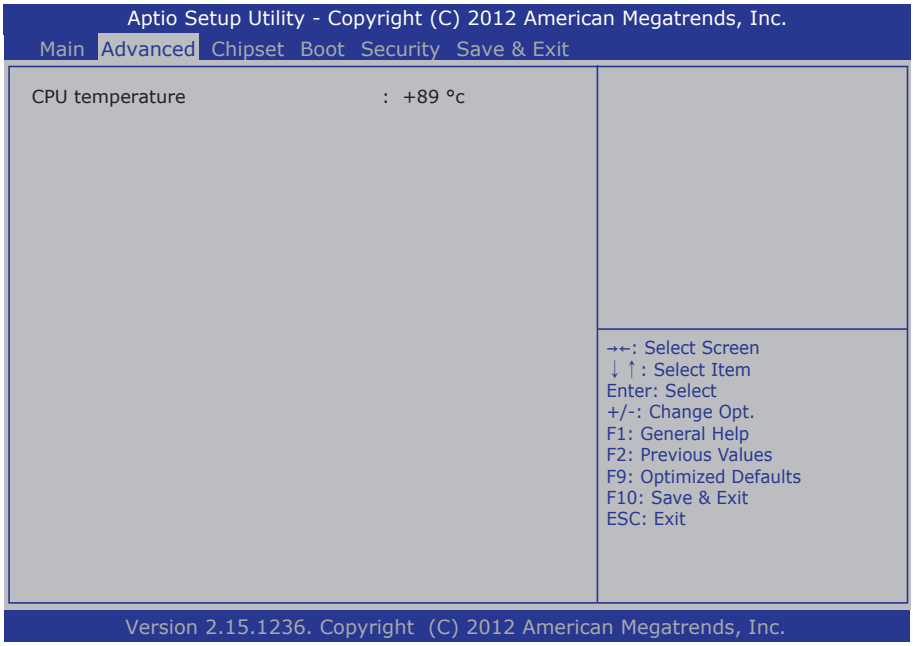
The featured submenus and setting are:

<table>
<tr><th>Submenu</th><th>Description</th></tr>
<tr><td rowspan="3">Serial Port 0 Configuration</td><td colspan="2">Configures the system's serial port 0. The featured settings are:</td></tr>
<tr><td>Setting</td><td>Description</td></tr>
<tr><td>Serial Port</td><td>Enables/disables the serial port.
▸ Enabled is the default.</td></tr>
<tr><td>Change Settings</td><td>Sets the optimal IO address and IRQ info for the serial port.
▸ Options available are:
IO=3F8h; IRQ=4 (default);
IO=3F8h; IRQ=3,4,5,7,10,11;
IO=2F8h; IRQ=3,4,5,7,10,11;
IO=3E8h; IRQ=3,4,5,7,10,11;
IO=2E8h; IRQ=3,4,5,7,10,11;
▸ This setting is only available when the serial port is enabled.</td></tr>
</table>

<table>
<tr><td>Serial Port 1 Configuration</td><td>Configures the system's serial port 1. The featured settings are:<table><tr><th>Setting</th><th>Description</th></tr><tr><td>Serial Port</td><td>Enables/disables the serial port.
Enabled is the default.</td></tr><tr><td>Change Settings</td><td>Sets the optimal IO address and IRQ info for the serial port:
Options available are:
IO=2F8h; IRQ=3 (default);
IO=3F8h; IRQ=3,4,5,7,10,11;
IO=2F8h; IRQ=3,4,5,7,10,11;
IO=3E8h; IRQ=3,4,5,7,10,11;
IO=2E8h; IRQ=3,4,5,7,10,11;
This setting is only available when the serial port is enabled.</td></tr></table></td></tr>
<tr><td>Restore on AC Power Loss</td><td>Sets whether the system should power on or power off when the power resumes after accidental power loss.
Options available are Power On (default) and Power Off.</td></tr>
</table>

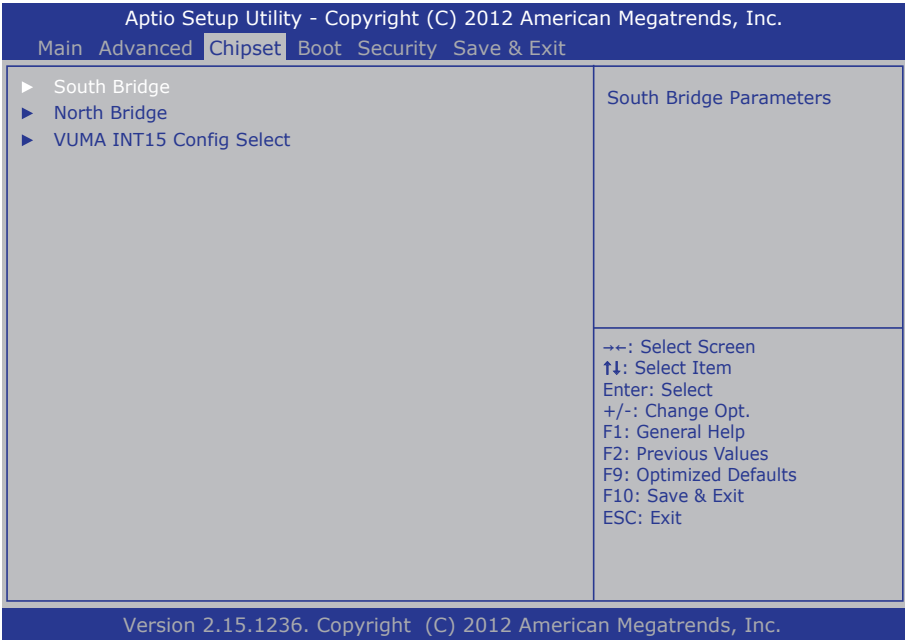
3.2.8. Hardware Monitor

Select this submenu to view the main board's hardware status.



3.3. Chipset

Access **Chipset** menu to configure the board's chipset features.

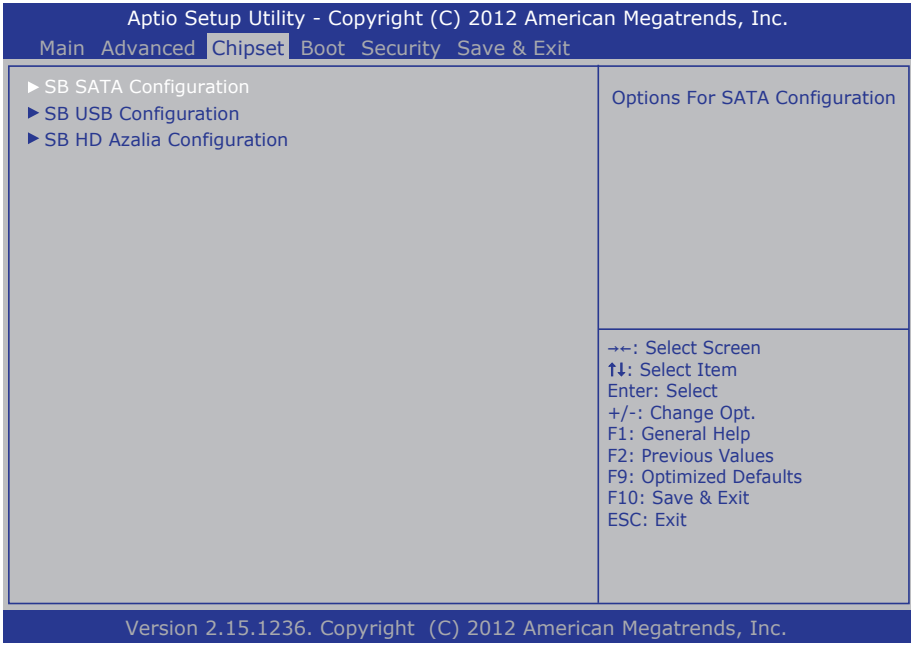


The featured submenus are:

Submenu	Description
South Bridge	Configures the Configures the host bridge, i.e. the northbridge. See 3.3.1. South Bridge on page 33 for more details.
North Bridge	Configures the southbridge. See 3.3.2. North Bridge on page 39 for more details.
VUMA INT15 Config Select	Configures the system's LVDS feature. See 3.3.3. VUMA INT15 Config Select on page 40 for more details.

3.3.1. South Bridge

Select this submenu to configure the system's south bridge features.

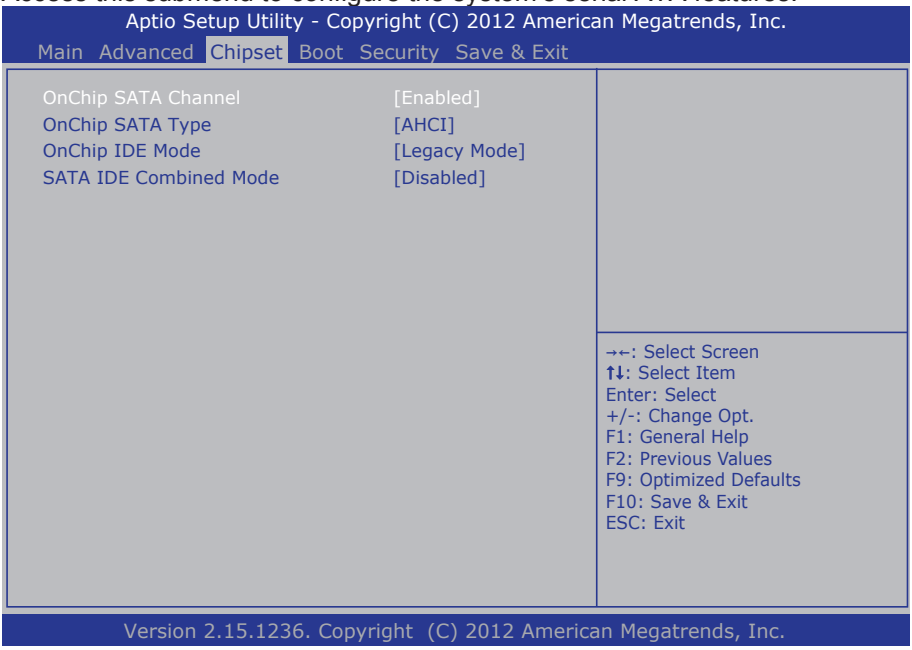


The featured submenus are:

Submenu	Description
SB SATA Configuration	Configures the system's SATA features. ▸ See 3.3.1.1. SB SATA Configuration on page 34.
SB USB Configuration	Configures the system's SATA features. ▸ See 3.3.1.2. SB USB Configuration on page 35.
SB HD Azalia Configuration	Configures the system's SATA features. ▸ See 3.3.1.3. HD Azalia Configuration on page 37.

3.3.1.1. SB SATA Configuration

Access this submenu to configure the system's serial ATA features.

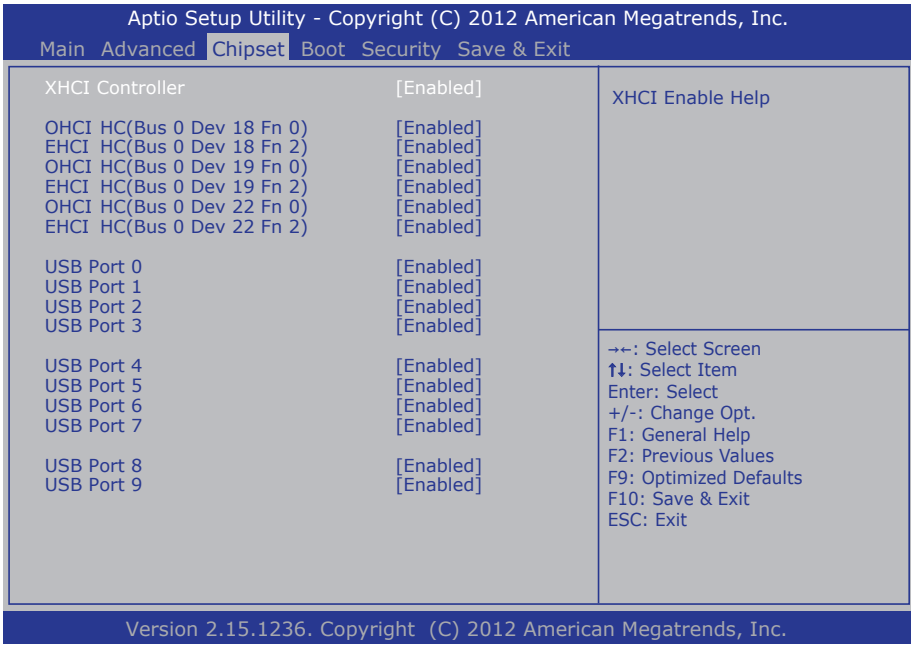


The featured settings are:

Setting	Description
OnChip SATA Channel	Enables/disables the system's serial ATA port. ▸ **Enabled** is the default.
OnChip SATA Type	Enables/disables AHCI feature for the SATA port: ▸ Options available are **Native IDE** (default), **AHCI** and **Legacy IDE**. ▸ This setting is only available when **OnChip SATA Channel** is enabled.
OnChip IDE Mode	Configures how the SATA controller works. ▸ Options available are **Legacy Mode** (default) and **Native Mode**. ▸ Leaves it as **Legacy Mode** to have the SATA controller use dedicated IRQs that cannot be shared with other device, which is suitable for the older operating systems such as Windows 95 and ME. ▸ This setting is only available when **OnChip SATA Channel** is enabled.
SATA IDE Combined Mode	Enables/disables SATA IDE combined mode. ▸ **Disabled** is the default. ▸ This setting is only available when **OnChip SATA Channel** is enabled.

3.3.1.2. SB USB Configuration

Access this submenu to configure the system's USB features.



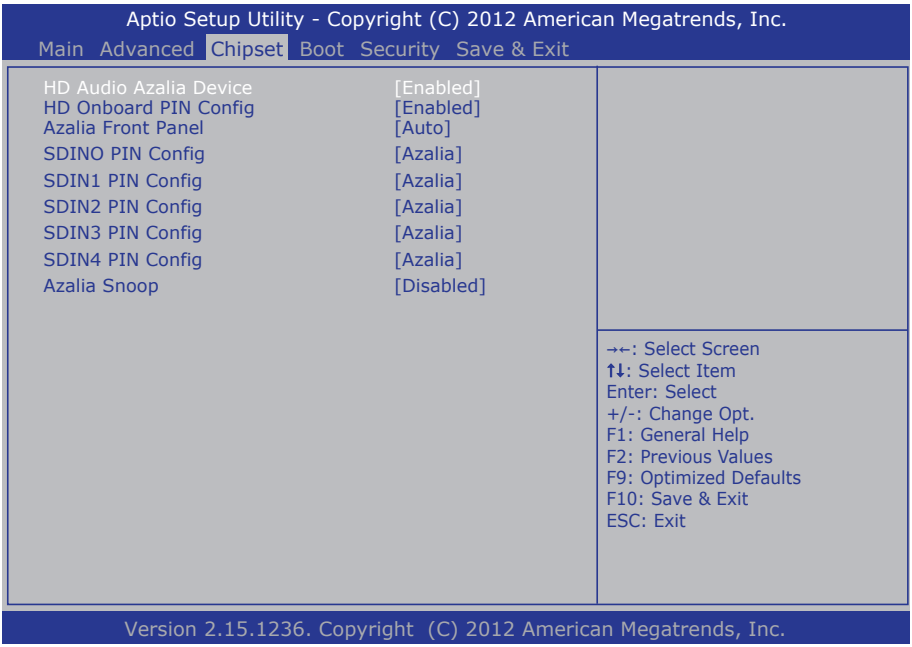
The featured settings are:

Setting	Description
XHCI Controller 0	Enables/disables xHCI (USB3.0) controller support. ▸ **Disabled** is the default.
OHCI HC (Bus 0 Dev 18 Fn 0)	Enables/disables OHCI HC (Bus 0 Dev 18 Fn 0) ▸ **Enabled** is the default. ▸ OHCI (Open Host Controller Interface) is a standard that allows a computer host to interface with Firewire and USB 1.0 and 1.1 devices.
EHCI HC (Bus 0 Dev 18 Fn 2)	Enables/disables EHCI HC (Bus 0 Dev 18 Fn 2). ▸ **Enabled** is the default. ▸ EHCI (Enhanced Host Controller Interface) is a standard that allows a computer host to interface with USB 2.0 devices.
OHCI HC (Bus 0 Dev 19 Fn 0)	Enables/disables OHCI HC (Bus 0 Dev 19 Fn 0) ▸ **Enabled** is the default. ▸ OHCI (Open Host Controller Interface) is a standard that allows a computer host to interface with Firewire and USB 1.0 and 1.1 devices.

EHCI HC (Bus 0 Dev 19 Fn 2)	Enables/disables EHCI HC (Bus 0 Dev 19 Fn 2). ▸ **Enabled** is the default. ▸ EHCI (Enhanced Host Controller Interface) is a standard that allows a computer host to interface with USB 2.0 devices.
OHCI HC (Bus 0 Dev 22 Fn 0)	Enables/disables OHCI HC (Bus 0 Dev 22 Fn 0) ▸ **Enabled** is the default. ▸ OHCI (Open Host Controller Interface) is a standard that allows a computer host to interface with Firewire and USB 1.0 and 1.1 devices. ▸ This setting is only available when **XHCI Controller** 0 is disabled.
EHCI HC (Bus 0 Dev 22 Fn 2)	Enables/disables EHCI HC (Bus 0 Dev 22 Fn 2). ▸ **Enabled** is the default. ▸ EHCI (Enhanced Host Controller Interface) is a standard that allows a computer host to interface with USB 2.0 devices. ▸ This setting is only available when **XHCI Controller** 0 is disabled.
USB Port 0	Enables/disables the USB port. ▸ **Enabled** is the default.
USB Port 1	Enables/disables the USB port. ▸ **Enabled** is the default.
USB Port 2	Enables/disables the USB port. ▸ **Enabled** is the default.
USB Port 3	Enables/disables the USB port. ▸ **Enabled** is the default.
USB Port 4	Enables/disables the USB port. ▸ **Enabled** is the default.
USB Port 5	Enables/disables the USB port. ▸ **Enabled** is the default.
USB Port 6	Enables/disables the USB port. ▸ **Enabled** is the default.
USB Port 7	Enables/disables the USB port. ▸ **Enabled** is the default.
USB Port 8	Enables/disables the USB port. ▸ **Enabled** is the default. ▸ This setting is only available when **XHCI Controller** 0 is disabled.
USB Port 9	Enables/disables the USB port. ▸ **Enabled** is the default. ▸ This setting is only available when **XHCI Controller** 0 is disabled.
XHCI0 Port 0	Enables/disables the USB port. ▸ **Enabled** is the default. ▸ This setting is only available when **XHCI Controller** 0 is enabled.
XHCI0 Port 1	Enables/disables the USB port. ▸ **Enabled** is the default. ▸ This setting is only available when **XHCI Controller** 0 is enabled.

3.3.1.3. HD Azalia Configuration

Access this submenu to configure the system's high-definition audio.



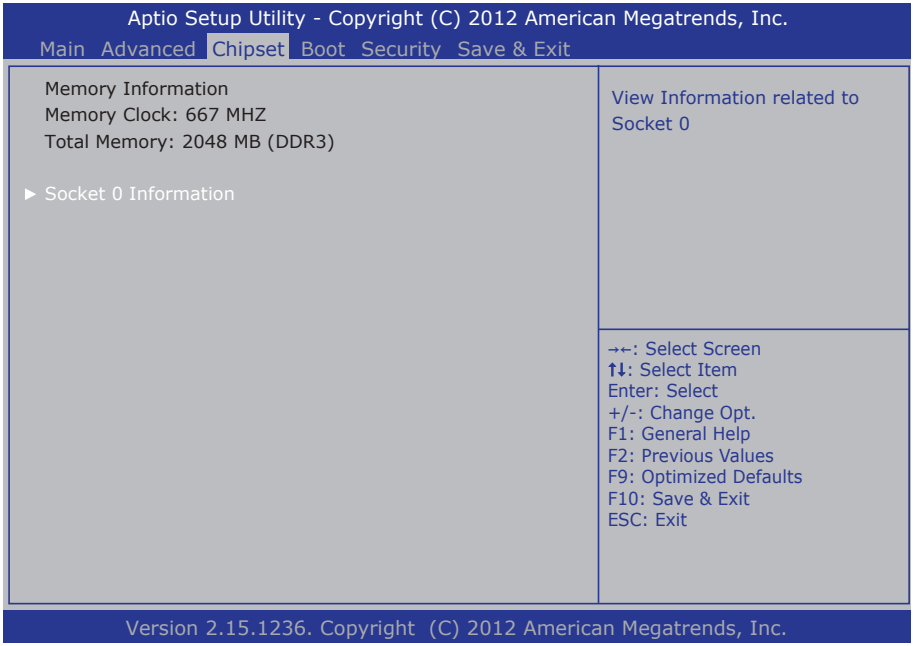
The featured settings are:

Setting	Description
HD Audio Azalia Device	Enables/disables the system's HD audio Azalia device. ▸ **Enabled** is the default.
HD Onboard PIN Config	Enables/disables the configuration of the pin definition of the onboard HD header. ▸ **Enabled** is the default.
Azalia Front Panel	Enables/disables the HD front panel header function, or leaves it on BIOS auto-configuration. ▸ Options available are **Auto** (default), **Enabled** and **Disabled**.
SDIN0 PIN Config	Enables/disables audio codec signal SDIN0. ▸ Options available are **Azalia** (default) and **GPIO**.
SDIN1 PIN Config	Enables/disables audio codec signal SDIN1. ▸ Options available are **Azalia** (default) and **GPIO**.
SDIN2 PIN Config	Enables/disables audio codec signal SDIN2. ▸ Options available are **Azalia** (default) and **GPIO**.

SDIN3 PIN Config	Enables/disables audio codec signal SDIN3. ▸ Options available are **Azalia** (default) and **GPIO**.
SDIN4 PIN Config	Enables/disables audio codec signal SDIN4. ▸ Options available are **Azalia** (default) and **GPIO**.
Azalia Snoop	Enables/disables the HD snoop function. ▸ **Disabled** is the default.

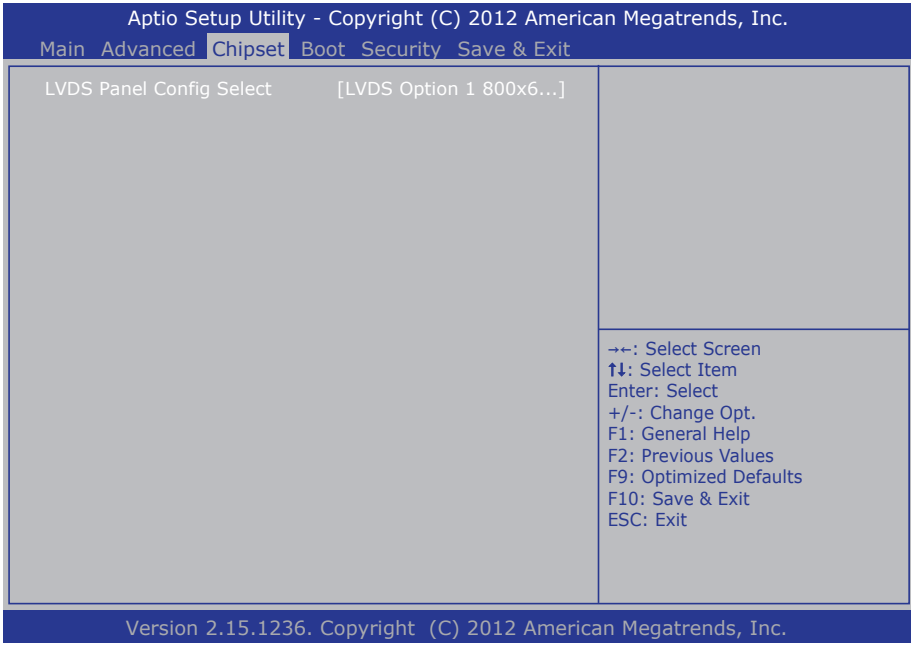
3.3.2. North Bridge

Select this submenu to view the system's memory info including memory clock, memory speed and the total memory capacity.



3.3.3. VUMA INT15 Config Select

Select this submenu to configure the system's LVDS feature.

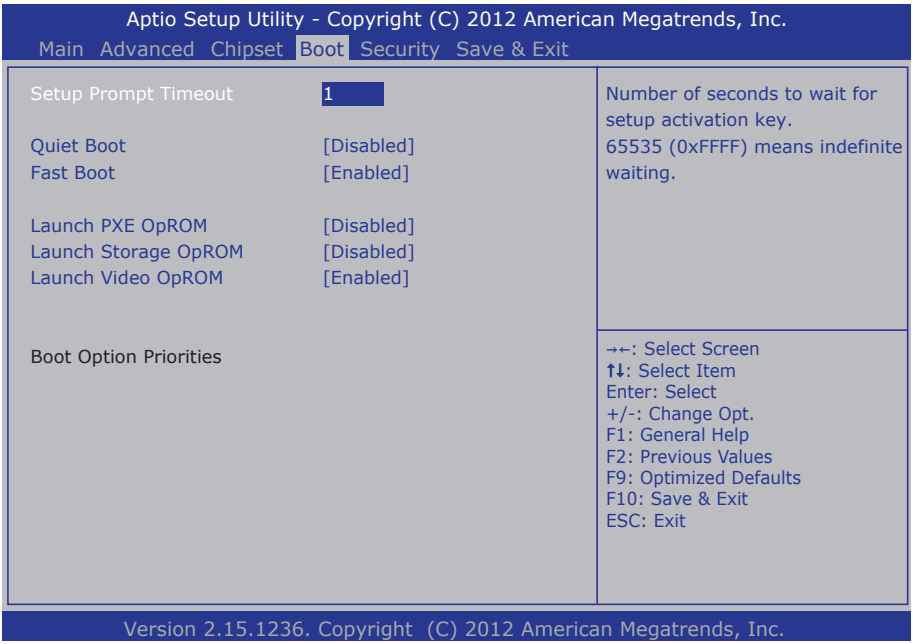


The featured settings are:

Setting	Description
LVDS Panel Config Select	Configures LVDS panel parameters. ▸ Options available are: **LVDS Option 1 800x600** (default) **LVDS Option 2 1024x768** **LVDS Option 3 1280x720** **LVDS Option 4 1280x800** **LVDS Option 5 1280x1024** **LVDS Option 6 1366x768** **LVDS Option 7 1440x900** **LVDS Option 8 1600x900** **LVDS Option 9 1920x1024**

3.4. Boot

Access this menu to configure how to boot up the system such as boot device priority.



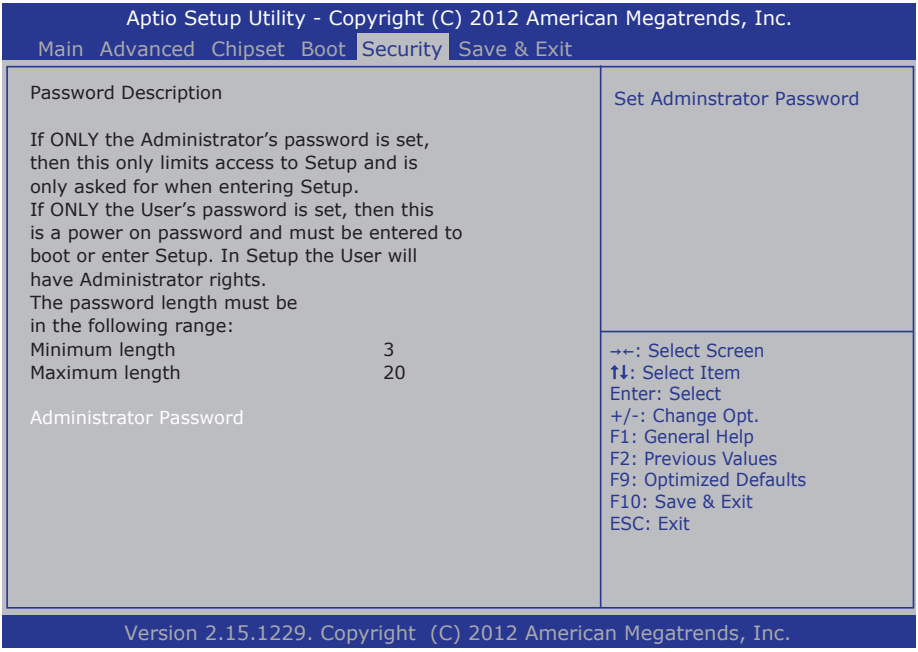
The featured settings are:

Setting6	Description
Setup Prompt Timeout	Sets how long to wait for the prompt to show for entering BIOS Setup. ▸ The default setting is **1** (sec). ▸ Set it to **65535** to wait indefinitely.
Quiet Boot	Sets whether to display the POST (Power-on Self Tests) messages or the system manufacturer's full screen logo during booting. ▸ Leave it as **Disabled**, which is the default, to display the normal POST message.
Fast Boot	Enables/disables initializing only a minimal set of devices required to launch the active boot options when booting up the system. ▸ **Disabled** is the default. ▸ This setting has no effect for BBS (BIOS Boot Specification) options. ▸ When enabled, the following settings become available:

<table>
<tr><td></td><td><table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>VGA Support</td><td>Enables/disables EFI VGA driver when booting up the system.
▸ Options available are Auto and EFI Driver (default).
▸ Select Auto to install only the legacy OpROM with the legacy OS and hide the logo during POST. (EFI driver will still be installed with the EFI OS.</td></tr>
<tr><td>USB Support</td><td>Enables/disables USB devices when booting up the system.
▸ Options available are Disabled, Full Initial (default) and Partial Initial.
▸ Select Disabled to make all USB devices unavailable until OS startup.
▸ Select Partial Initial to make specific USB port/device unavailable until OS startup.
▸ Leave it as Full Initial to make all USB devices available in OS and POST.</td></tr>
<tr><td>PS2 Devices Support</td><td>Enables/disables PS2 (keyboard and mouse) devices when booting up the system.
▸ Enabled is the default.
▸ Select Disabled to skip PS2 devices during POST.</td></tr>
<tr><td>Network Stack Driver Support</td><td>Enables/disables network stack driver when booting up the system.
▸ Disabled is the default.</td></tr>
</table></td></tr>
<tr><td>Launch PXE OpROM</td><td>Enables/disables the option for legacy network device
▸ Disabled is the default.</td></tr>
<tr><td>Launch Storage OpROM</td><td>Enables/disables the option for legacy mass storage devices with option ROM.
▸ Disabled is the default.</td></tr>
<tr><td>Launch Video OpROM</td><td>Enables/disables the option for legacy video devices with option ROM.
▸ Enabled is the default.</td></tr>
<tr><td>Boot Option Priorities</td><td>Sets the boot priority among the available device types.</td></tr>
<tr><td>Hard Drive BBS Priorities</td><td>Configures the very 1st boot device among the available hard disk drives.
▸ Option(s) available are the available storage device(s) and Disabled.</td></tr>
</table>

3.5. Security

Access this submenu to set up the password for the system's administrator account. Once the administrator password is set up, this BIOS Setup utility is limited to access and will ask for the password each time any access is attempted.

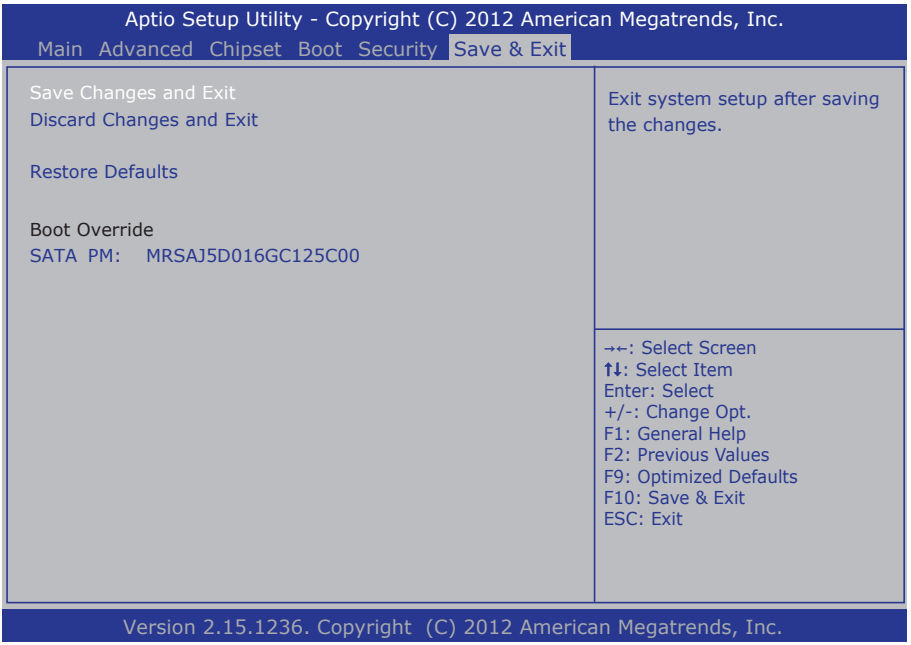


The featured setting is:

Setting	Description
Administrator Password	To set up an administrator password: 1. Select **Administrator Password**. 2. An **Create New Password** dialog then pops up onscreen. 3. Enter your desired password that is no less than 3 characters and no more than 20 characters. 4. Hit [Enter] key to submit.

3.6. Save & Exit

This menu features a handful of commands to launch actions from the BIOS Setup utility regarding saving changes, quitting the utility and recovering defaults.



The features settings are:

Setting	Description
Save Changes and Exit	Saves the changes and quits the BIOS Setup utility.
Discard Changes and Exit	Quits the BIOS Setup utility without saving the change(s).
Restore Defaults	Restores all settings to defaults. ▸ This is a command to launch an action from the BIOS Setup utility rather than a setting.
Boot Override	**Boot Override** presents a list in context with the boot devices in the system. Select the device to boot up the system regardless of the currently configured boot priority. ▸ This is a command to launch an action from the BIOS Setup utility rather than a setting.

Appendix

A: I/O Port Address Map

Each peripheral device in the system is assigned a set of I/O port addresses which also becomes the identity of the device.

The following table lists the I/O port addresses used.

Address	Device Description
0x0000F140-0x0000F147	Standard Dual Channel PCI IDE Controller
0x0000F130-0x0000F133	Standard Dual Channel PCI IDE Controller
0x0000F120-0x0000F127	Standard Dual Channel PCI IDE Controller
0x0000F110-0x0000F113	Standard Dual Channel PCI IDE Controller
0x0000F100-0x0000F10F	Standard Dual Channel PCI IDE Controller
0x000003F8-0x000003FF	Communications Port (COM1)
0x000002F8-0x000002FF	Communications Port (COM2)
0x00000061-0x00000061	System speaker
0x00000000-0x000003AF	PCI bus
0x00000000-0x000003AF	Motherboard resources
0x00000000-0x000003AF	Direct memory access controller
0x000003E0-0x00000CF7	PCI bus
0x000003B0-0x000003DF	PCI bus
0x000003B0-0x000003DF	Standard VGA Graphics Adapter
0x00000D00-0x0000FFFF	PCI bus
0x00000070-0x00000071	System CMOS/real time clock
0x0000D000-0x0000D0FF	Ethernet Controller
0x0000D000-0x0000D0FF	PCI Express standard Root Port
0x00000010-0x0000001F	Motherboard resources
0x00000010-0x0000001F	Motherboard resources
0x00000022-0x0000003F	Motherboard resources
0x00000022-0x0000003F	Motherboard resources
0x00000044-0x0000005F	Motherboard resources
0x00000072-0x0000007F	Motherboard resources
0x00000072-0x0000007F	Motherboard resources
0x00000080-0x00000080	Motherboard resources
0x00000080-0x00000080	Motherboard resources

Address	Device Description
0x00000084-0x00000086	Motherboard resources
0x00000084-0x00000086	Motherboard resources
0x00000088-0x00000088	Motherboard resources
0x00000088-0x00000088	Motherboard resources
0x0000008C-0x0000008E	Motherboard resources
0x0000008C-0x0000008E	Motherboard resources
0x00000090-0x0000009F	Motherboard resources
0x00000090-0x0000009F	Motherboard resources
0x000000A2-0x000000BF	Motherboard resources
0x000000A2-0x000000BF	Motherboard resources
0x000000E0-0x000000EF	Motherboard resources
0x000000E0-0x000000EF	Motherboard resources
0x000004D0-0x000004D1	Motherboard resources
0x000004D0-0x000004D1	Motherboard resources
0x00000E00-0x00000E0F	Motherboard resources
0x0000E000-0x0000E01F	Ethernet Controller
0x0000E000-0x0000E01F	PCI Express standard Root Port
0x00000063-0x00000063	Motherboard resources
0x00000065-0x00000065	Motherboard resources
0x00000067-0x0000006F	Motherboard resources
0x000000B1-0x000000B1	Motherboard resources
0x0000040B-0x0000040B	Motherboard resources
0x000004D6-0x000004D6	Motherboard resources
0x00000C00-0x00000C01	Motherboard resources
0x00000C14-0x00000C14	Motherboard resources
0x00000C50-0x00000C51	Motherboard resources
0x00000C52-0x00000C52	Motherboard resources
0x00000C6C-0x00000C6C	Motherboard resources
0x00000C6F-0x00000C6F	Motherboard resources
0x00000CD0-0x00000CD1	Motherboard resources
0x00000CD2-0x00000CD3	Motherboard resources
0x00000CD4-0x00000CD5	Motherboard resources
0x00000CD6-0x00000CD7	Motherboard resources

Address	Device Description
0x00000CD8-0x00000CDF	Motherboard resources
0x00000800-0x0000089F	Motherboard resources
0x00000B20-0x00000B3F	Motherboard resources
0x00000900-0x0000090F	Motherboard resources
0x00000910-0x0000091F	Motherboard resources
0x0000FE00-0x0000FEFE	Motherboard resources
0x0000F000-0x0000F0FF	Standard VGA Graphics Adapter
0x000003C0-0x000003DF	Standard VGA Graphics Adapter
0x000000F0-0x000000FF	Numeric data processor
0x00000060-0x00000060	Standard PS/2 Keyboard
0x00000064-0x00000064	Standard PS/2 Keyboard
0x00000020-0x00000021	Programmable interrupt controller
0x000000A0-0x000000A1	Programmable interrupt controller
0x00000040-0x00000043	System timer
0x00000081-0x00000083	Direct memory access controller
0x00000087-0x00000087	Direct memory access controller
0x00000089-0x0000008B	Direct memory access controller
0x0000008F-0x0000008F	Direct memory access controller
0x000000C0-0x000000DF	Direct memory access controller

B: Interrupt Request Lines (IRQ)

Peripheral devices use interrupt request lines to notify CPU for the service required. The following table shows the IRQ used by the devices on board.

Level	Function
IRQ 19	Standard Dual Channel PCI IDE Controller
IRQ 16	High Definition Audio Controller
IRQ 4	Communications Port (COM1)
IRQ 3	Communications Port (COM2)
IRQ 18	Standard OpenHCD USB Host Controller
IRQ 18	Standard OpenHCD USB Host Controller
IRQ 18	Standard OpenHCD USB Host Controller
IRQ 8	System CMOS/real time clock
IRQ 11	Ethernet Controller
IRQ 11	Ethernet Controller
IRQ 17	Standard Enhanced PCI to USB Host Controller
IRQ 17	Standard Enhanced PCI to USB Host Controller
IRQ 17	Standard Enhanced PCI to USB Host Controller
IRQ 13	Numeric data processor
IRQ 45	High Definition Audio Controller
IRQ 81	Microsoft ACPI-Compliant System
IRQ 82	Microsoft ACPI-Compliant System
IRQ 83	Microsoft ACPI-Compliant System
IRQ 84	Microsoft ACPI-Compliant System
IRQ 85	Microsoft ACPI-Compliant System
IRQ 86	Microsoft ACPI-Compliant System
IRQ 87	Microsoft ACPI-Compliant System
IRQ 88	Microsoft ACPI-Compliant System
IRQ 89	Microsoft ACPI-Compliant System
IRQ 90	Microsoft ACPI-Compliant System
IRQ 91	Microsoft ACPI-Compliant System
IRQ 92	Microsoft ACPI-Compliant System

Level	Function
IRQ 93	Microsoft ACPI-Compliant System
IRQ 94	Microsoft ACPI-Compliant System
IRQ 95	Microsoft ACPI-Compliant System
IRQ 96	Microsoft ACPI-Compliant System
IRQ 97	Microsoft ACPI-Compliant System
IRQ 98	Microsoft ACPI-Compliant System
IRQ 99	Microsoft ACPI-Compliant System
IRQ 100	Microsoft ACPI-Compliant System
IRQ 101	Microsoft ACPI-Compliant System
IRQ 102	Microsoft ACPI-Compliant System
IRQ 103	Microsoft ACPI-Compliant System
IRQ 104	Microsoft ACPI-Compliant System
IRQ 105	Microsoft ACPI-Compliant System
IRQ 106	Microsoft ACPI-Compliant System
IRQ 107	Microsoft ACPI-Compliant System
IRQ 108	Microsoft ACPI-Compliant System
IRQ 109	Microsoft ACPI-Compliant System
IRQ 110	Microsoft ACPI-Compliant System
IRQ 111	Microsoft ACPI-Compliant System
IRQ 112	Microsoft ACPI-Compliant System
IRQ 113	Microsoft ACPI-Compliant System
IRQ 114	Microsoft ACPI-Compliant System
IRQ 115	Microsoft ACPI-Compliant System
IRQ 116	Microsoft ACPI-Compliant System
IRQ 117	Microsoft ACPI-Compliant System
IRQ 118	Microsoft ACPI-Compliant System
IRQ 119	Microsoft ACPI-Compliant System
IRQ 120	Microsoft ACPI-Compliant System
IRQ 121	Microsoft ACPI-Compliant System
IRQ 122	Microsoft ACPI-Compliant System
IRQ 123	Microsoft ACPI-Compliant System
IRQ 124	Microsoft ACPI-Compliant System
IRQ 125	Microsoft ACPI-Compliant System

Level	Function
IRQ 126	Microsoft ACPI-Compliant System
IRQ 127	Microsoft ACPI-Compliant System
IRQ 128	Microsoft ACPI-Compliant System
IRQ 129	Microsoft ACPI-Compliant System
IRQ 130	Microsoft ACPI-Compliant System
IRQ 131	Microsoft ACPI-Compliant System
IRQ 132	Microsoft ACPI-Compliant System
IRQ 133	Microsoft ACPI-Compliant System
IRQ 134	Microsoft ACPI-Compliant System
IRQ 135	Microsoft ACPI-Compliant System
IRQ 136	Microsoft ACPI-Compliant System
IRQ 137	Microsoft ACPI-Compliant System
IRQ 138	Microsoft ACPI-Compliant System
IRQ 139	Microsoft ACPI-Compliant System
IRQ 140	Microsoft ACPI-Compliant System
IRQ 141	Microsoft ACPI-Compliant System
IRQ 142	Microsoft ACPI-Compliant System
IRQ 143	Microsoft ACPI-Compliant System
IRQ 144	Microsoft ACPI-Compliant System
IRQ 145	Microsoft ACPI-Compliant System
IRQ 146	Microsoft ACPI-Compliant System
IRQ 147	Microsoft ACPI-Compliant System
IRQ 148	Microsoft ACPI-Compliant System
IRQ 149	Microsoft ACPI-Compliant System
IRQ 150	Microsoft ACPI-Compliant System
IRQ 151	Microsoft ACPI-Compliant System
IRQ 152	Microsoft ACPI-Compliant System
IRQ 153	Microsoft ACPI-Compliant System
IRQ 154	Microsoft ACPI-Compliant System
IRQ 155	Microsoft ACPI-Compliant System
IRQ 156	Microsoft ACPI-Compliant System
IRQ 157	Microsoft ACPI-Compliant System
IRQ 158	Microsoft ACPI-Compliant System

Level	Function
IRQ 159	Microsoft ACPI-Compliant System
IRQ 160	Microsoft ACPI-Compliant System
IRQ 161	Microsoft ACPI-Compliant System
IRQ 162	Microsoft ACPI-Compliant System
IRQ 163	Microsoft ACPI-Compliant System
IRQ 164	Microsoft ACPI-Compliant System
IRQ 165	Microsoft ACPI-Compliant System
IRQ 166	Microsoft ACPI-Compliant System
IRQ 167	Microsoft ACPI-Compliant System
IRQ 168	Microsoft ACPI-Compliant System
IRQ 169	Microsoft ACPI-Compliant System
IRQ 170	Microsoft ACPI-Compliant System
IRQ 171	Microsoft ACPI-Compliant System
IRQ 172	Microsoft ACPI-Compliant System
IRQ 173	Microsoft ACPI-Compliant System
IRQ 174	Microsoft ACPI-Compliant System
IRQ 175	Microsoft ACPI-Compliant System
IRQ 176	Microsoft ACPI-Compliant System
IRQ 177	Microsoft ACPI-Compliant System
IRQ 178	Microsoft ACPI-Compliant System
IRQ 179	Microsoft ACPI-Compliant System
IRQ 180	Microsoft ACPI-Compliant System
IRQ 181	Microsoft ACPI-Compliant System
IRQ 182	Microsoft ACPI-Compliant System
IRQ 183	Microsoft ACPI-Compliant System
IRQ 184	Microsoft ACPI-Compliant System
IRQ 185	Microsoft ACPI-Compliant System
IRQ 186	Microsoft ACPI-Compliant System
IRQ 187	Microsoft ACPI-Compliant System
IRQ 188	Microsoft ACPI-Compliant System
IRQ 189	Microsoft ACPI-Compliant System
IRQ 190	Microsoft ACPI-Compliant System
IRQ 1	Standard PS/2 Keyboard

Level	Function
IRQ 4294967294	PCI Express standard Root Port
IRQ 12	Microsoft PS/2 Mouse
IRQ 0	System timer
IRQ 4294967293	PCI Express standard Root Port

C: BIOS Memory Map

Address	Device Description
0xFEB6E000-0xFEB6E3FF	Standard Dual Channel PCI IDE Controller
0xFEB60000-0xFEB63FFF	High Definition Audio Controller
0xFEB6D000-0xFEB6DFFF	Standard OpenHCD USB Host Controller
0xA0000-0xBFFFF	PCI bus
0xA0000-0xBFFFF	Standard VGA Graphics Adapter
0xC0000-0xDFFFF	PCI bus
0x80000000-0xFFFFFFFF	PCI bus
0xFEB6B000-0xFEB6BFFF	Standard OpenHCD USB Host Controller
0xD0804000-0xD0804FFF	Ethernet Controller
0xD0800000-0xD0803FFF	Ethernet Controller
0xD0800000-0xD0803FFF	PCI Express standard Root Port
0xE0000000-0xEFFFFFFF	System board
0xFEB69000-0xFEB69FFF	Standard OpenHCD USB Host Controller
0xFEA40000-0xFEA5FFFF	Ethernet Controller
0xFE900000-0xFE9FFFFF	Ethernet Controller
0xFE900000-0xFE9FFFFF	PCI Express standard Root Port
0xFEA60000-0xFEA63FFF	Ethernet Controller
0x60000000-0x7FFFFFFF	Motherboard resources
0xFEC00000-0xFEC00FFF	Motherboard resources
0xFEE00000-0xFEE00FFF	Motherboard resources
0xFED80000-0xFED8FFFF	Motherboard resources
0xFED61000-0xFED70FFF	Motherboard resources
0xFEC10000-0xFEC10FFF	Motherboard resources
0xFED00000-0xFED00FFF	Motherboard resources
0xFED00000-0xFED00FFF	High precision event timer
0xFF000000-0xFFFFFFFF	Motherboard resources
0xC0000000-0xCFFFFFFF	Standard VGA Graphics Adapter
0xD0000000-0xD07FFFFF	Standard VGA Graphics Adapter
0xFEB00000-0xFEB3FFFF	Standard VGA Graphics Adapter
0xFEB6C000-0xFEB6C0FF	Standard Enhanced PCI to USB Host Controller
0xFEB64000-0xFEB67FFF	High Definition Audio Controller
0xFEB6A000-0xFEB6A0FF	Standard Enhanced PCI to USB Host Controller
0xFEB68000-0xFEB680FF	Standard Enhanced PCI to USB Host Controller

E: Watchdog Timer (WDT) Setting

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

This board supports 255 levels watchdog timer by software programming I/O ports. Below are the source codes written in C, please take them as WDT application example.

Sample Code:

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

#define  DELAY_TIME                    10

int SMB_PORT_AD    = 0x0B00;
int SMB_DEVICE_ADD = 0x6e;            /* Add = 6eh or 9ch */

unsigned char SMB_Byte_READ(int SMPORT, int DeviceID, int iREG_INDEX);
void SMB_Byte_WRITE(int SMPORT, int DeviceID, int oREG_INDEX, int oREG_
DATA);

/*----- routing, sub-routing -----*/
void main()
{
        unsigned char bData;

        /* Configuration and Control Register - Enable WDTOUT10# output
*/
        bData = SMB_Byte_READ(SMB_PORT_AD,SMB_DEVICE_ADD,0x01);
        bData = bData | 0x20;
        SMB_Byte_WRITE(SMB_PORT_AD,SMB_DEVICE_ADD,0x01,bData);
        delay(DELAY_TIME);

        /* WDTOUT10 Control Register - Enable WDTOUT10 Output Timer */
        SMB_Byte_WRITE(SMB_PORT_AD,SMB_DEVICE_ADD,0x35,0x85);
        delay(DELAY_TIME);
}
```

F: Digital I/O Setting

Below are the source codes written in C. Take them for Digital I/O application examples. The default I/O address is 6Eh.

Sample Code:

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

#define  DELAY_TIME                    10

int SMB_PORT_AD    = 0x0B00;
int SMB_DEVICE_ADD = 0x6e;            /* Add = 6eh or 9ch */

void Digital_IO_Init(void);
unsigned char Digital_Input(void);
void Digital_Output(unsigned char oData);
unsigned char SMB_Byte_READ(int SMPORT, int DeviceID, int iREG_INDEX);
void SMB_Byte_WRITE(int SMPORT, int DeviceID, int oREG_INDEX, int
oREG_DATA);

/*----- routing, sub-routing -----*/
void main()
{
    unsigned char DataIn;

        Digital_IO_Init();

    Digital_Output(0x5);
    delay(2000);

    DataIn = Digital_Input();
    printf(" Input : %x \n",DataIn);
    delay(2000);

    Digital_Output(0xA);
    delay(2000);

    DataIn = Digital_Input();
    printf(" Input : %x \n",DataIn);
    delay(2000);
}

void Digital_IO_Init(void)
{
    /* DIO In 0~3 Mode, Out 4~7 Mode*/
```

```
        SMB_Byte_WRITE(SMB_PORT_AD,SMB_DEVICE_ADD,0x20,0xf0);
    delay(DELAY_TIME);
}

unsigned char Digital_Input(void)
{
        unsigned char bData;

        /* DIO In 0~3 Status */
        bData = SMB_Byte_READ(SMB_PORT_AD,SMB_DEVICE_ADD,0x22) & 0x0f;

    return bData;
}

void Digital_Output(unsigned char oData)
{
    /* DIO Out 4~7 Data */
        oData = oData << 4;
        SMB_Byte_WRITE(SMB_PORT_AD,SMB_DEVICE_ADD,0x21,oData);
    delay(DELAY_TIME);
}
```