MS-98E6

(v1.x) Industrial Computer Board

Copyright Notice

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Trademarks

All trademarks are the properties of their respective owners.

Revision History

Revision	Date
V1.1	2018/ 01

Technical Support

If a problem arises with your system and no solution can be obtained from the user's manual, please contact your place of purchase or local distributor. Alternatively, please try the following help resources for further guidance.

Visit the MSI website for technical guide, BIOS updates, driver updates and other information, or contact our technical staff via http://www.msi.com/support/

Safety Instructions

- Always read the safety instructions carefully.
- Keep this User's Manual for future reference.
- Keep this equipment away from humidity.
- Lay this equipment on a reliable flat surface before setting it up.
- The openings on the enclosure are for air convection hence protects the equipment from overheating. DO NOT COVER THE OPENINGS.
- Make sure the voltage of the power source and adjust properly 110/220V before connecting the equipment to the power inlet.
- Place the power cord such a way that people can not step on it. Do not place anything over the power cord.
- Always Unplug the Power Cord before inserting any add-on card or module.
- All cautions and warnings on the equipment should be noted.
- Never pour any liquid into the opening that could damage or cause electrical shock.
- If any of the following situations arises, get the equipment checked by service personnel:
  - The power cord or plug is damaged.
  - Liquid has penetrated into the equipment.
  - The equipment has been exposed to moisture.
  - The equipment does not work well or you can not get it work according to User's Manual.
  - The equipment has dropped and damaged.
  - The equipment has obvious sign of breakage.
- DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT UNCONDITIONED, STORAGE TEMPERATURE ABOVE 60°C (140°F), IT MAY DAMAGE THE EQUIPMENT.

警告使用者:

這是甲類資訊產品，在居住的環境中使用時，可能會造成無線電干擾，在這種情況下，使用者會被要求採取某些適當的對策。

Chemical Substances Information

In compliance with chemical substances regulations, such as the EU REACH Regulation (Regulation EC No. 1907/2006 of the European Parliament and the Council), MSI provides the information of chemical substances in products at:

http://www.msi.com/html/popup/csr/evmtprtt_pcm.html

Battery Information

European Union:

Batteries, battery packs, and accumulators should not be disposed of as unsorted household waste. Please use the public collection system to return, recycle, or treat them in compliance with the local regulations.

廢電池請回收

Taiwan:

For better environmental protection, waste batteries should be collected separately for recycling or special disposal.

California, USA:

The button cell battery may contain perchlorate material and requires special handling when recycled or disposed of in California.

For further information please visit:

http://www.dtsc.ca.gov/hazardouswaste/perchlorate/

Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer.

CE Conformity

Hereby, Micro-Star International CO., LTD declares that this device is in compliance with the essential safety requirements and other relevant provisions set out in the European Directive.

FCC-A Radio Frequency Interference Statement

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

Notice 1

The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Notice 2

Shielded interface cables and AC power cord, if any, must be used in order to comply with the emission limits.

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.

WEEE Statement

Under the European Union ("EU") Directive on Waste Electrical and Electronic Equipment, Directive 2002/96/EC, which takes effect on August 13, 2005, products of "electrical and electronic equipment" cannot be discarded as municipal waste anymore and manufacturers of covered electronic equipment will be obligated to take back such products at the end of their useful life. MSI will comply with the product take back requirements at the end of life of MSI-branded products that are sold into the EU. You can return these products to local collection points.

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1 Overview

Thank you for choosing the MS-98E6, an excellent industrial computer board.

Based on the innovative Intel® Apollo Lake/ Apollo Lake-I Series SoC for optimal system efficiency, the MS-98E6 supports up to 8GB of onboard DDR3L 1600 / 1866MHz memory and allows connection to 3 independent displays with HDMI, DisplayPort, LVDS and eDP outputs.

The MS-98E6 is durable under extreme environments and suitable to be applied in every industrial field, such as digital signage, kiosk, gaming, industrial control automation and POS.

Motherboard Specifications

Processor

- Intel Pentium N4200 QC 1.1GHz/2.5GHz (Burst)
- Intel Celeron N3350 DC 1.1GHz/2.4GHz (Burst)
- Intel Atom X7-E3950 QC 1.6GHz/2.0GHz (Burst)
- Intel Atom X5-E3940 QC 1.6/1.8GHz (Burst)
- Intel Atom X5-E3930 DC 1.3/1.8GHz (Burst)

Memory

- 1 SO-DIMM slot for single-channel Non-ECC DDR3L 1600 / 1866MHz
- Up to 8GB

Networking

- Intel® I210-IT GbE LAN * 2 (For Apollo Lake-I Only)
- Intel® I211-AT GbE LAN * 2 (For Apollo Lake Only)

Storage

- 1 x SATA 6Gb/s port
- 1 x mSATA 6Gb/s slot (shared with Mini-PCIe2)

Audio

- Realtek® ALC887-VD2-CG HD Audio Codec
- 1 x Audio/Amplifier/SMbus connector
- 1 x Amplifier connector

Graphics

- HD Graphics integrated in Intel® processor
- LVDS up to 1920 x 1200 @ 60 Hz
- HDMI1 up to 1920 x 1080 @ 60 Hz
- HDMI2 up to 3840 x 2160 @ 30 Hz
- DisplayPort 1/2 up to 4096 x 2160 @ 60 Hz
- eDP up to 3840 x 2160 @ 60 Hz
- Supports three independent displays: LVDS/HDMI/DisplayPort/eDP

Rear Panel I/O

- 1 x HDMI port (Co-lay DisplayPort by Request)
- 1 x DisplayPort (Co-lay HDMI port by Request)
- 2 x RJ45 GbE LAN ports
- 4 x USB 3.0 ports

Onboard Connectors

- 1 x 4-pin DC power connector (For Apollo Lake Only)
- 1 x 2-pin DC power connector (For Apollo Lake-I Only)
- 1 x 4-pin SATA power connector
- 1 x System FAN connector
- 1 x SATA 6Gb/s port
- 1 x USB 2.0 connector (2 ports)
- 1 x RS-232/422/485 serial port connector
- 5 x RS232 serial port connectors
- 3 x COM port power jumpers
- 1 x Front panel connector
- 1 x Audio/Amplifier/SMbus Connector
- 1 x GPIO connector
- 2 x LVDS connectors
- 2 x LVDS power jumpers
- 2 x LVDS inverter connectors
- 2 x LVDS inverter power jumpers
- 1 x TPM 2.0(LPC Header)
- 1 x Clear CMOS jumper
- 1 x AT/ATX select jumper
- 1 x eDP connector
- 1 x MIPI-CSI 2.0 connector (Support By Request)

Expansion Slot

- 1 x Micro SD socket
- 1 x Mini-PCIe1 (Full -size, with Nano SIM-Holder)
- 1 x Mini-PCIe2 (Full-size, with m-SATA)

Form Factor

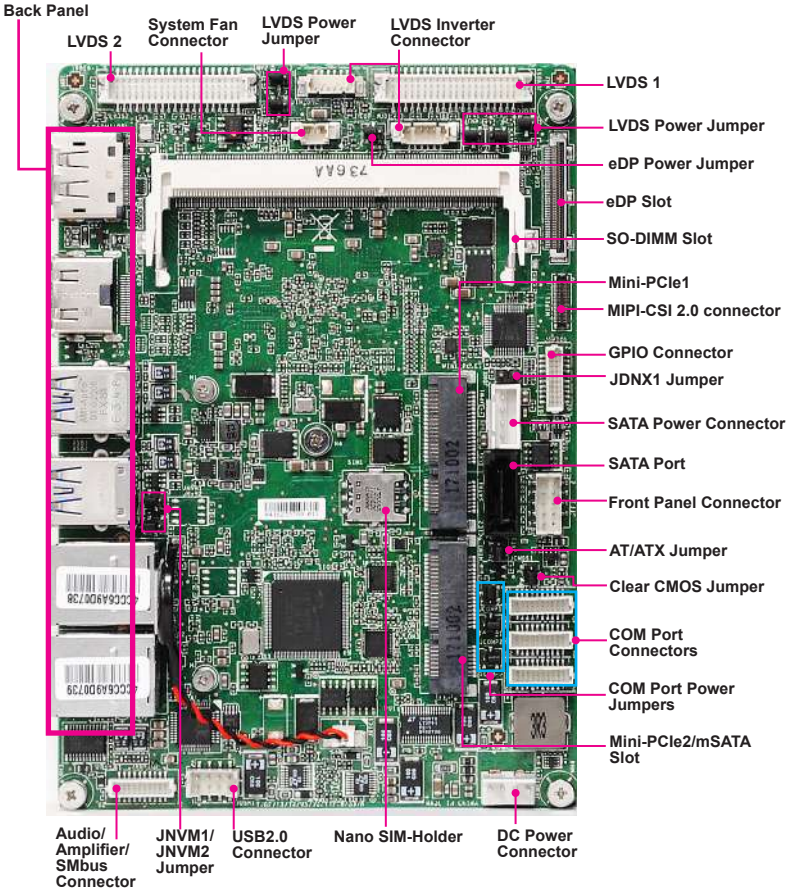
- 146 mm x 102 mm (3.5-inch size)

Environment

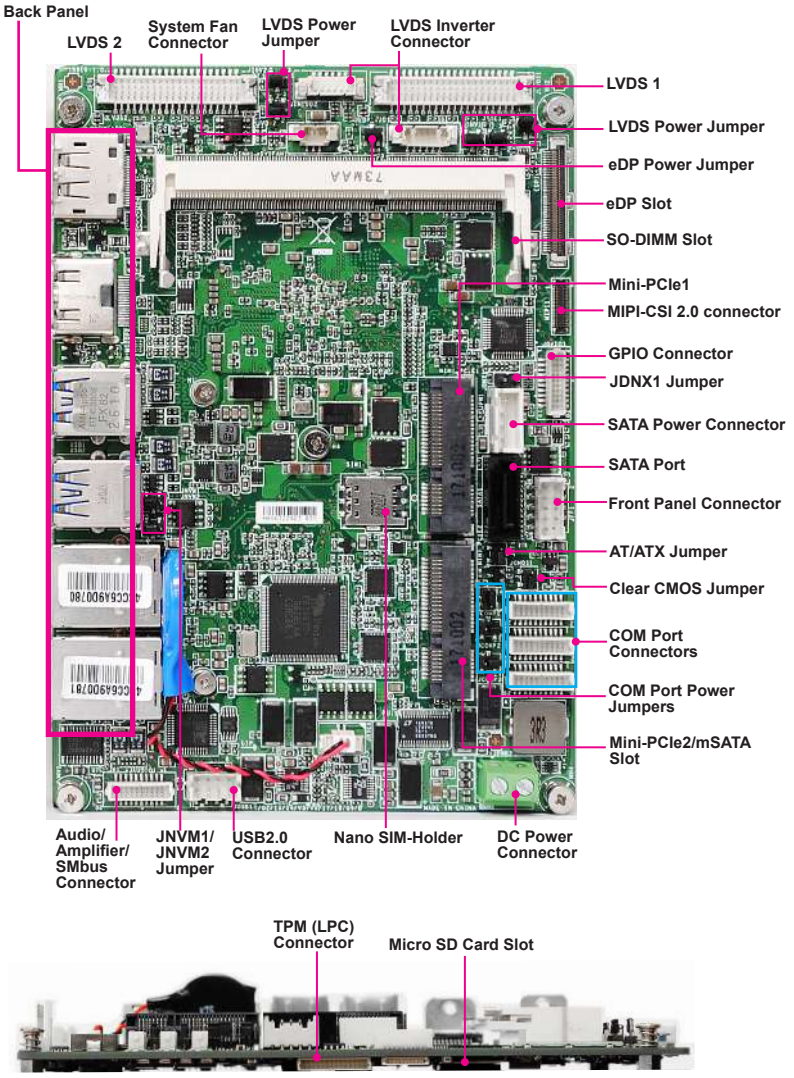
- Operating temperature: -10 ~ 60°C (For Apollo Lake)
  Operating temperature: -40 ~ 85°C (For Apollo Lake-I)
- Storage temperature: -20 ~ 80°C (For Apollo Lake)
  Storage temperature: -40 ~ 85°C (For Apollo Lake-I)
- Humidity: 10 ~ 90% RH, non-condensing

Motherboard Layout

Apollo Lake



Apollo Lake-I



Rear Panel I/O Options

Standard

Option 1

Option 2

2 Hardware Setup

This chapter provides you with the information about hardware setup procedures. While doing the installation, be careful in holding the components and follow the installation procedures. For some components, if you install in the wrong orientation, the components will not work properly.
Use a grounded wrist strap before handling computer components. Static electricity may damage the components.

Components Reference Guide

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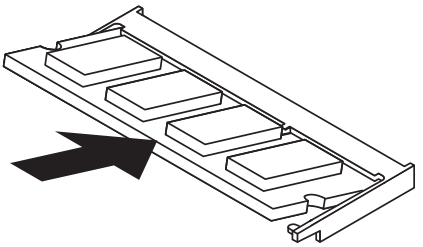
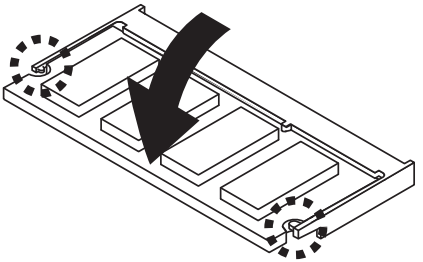
Memory

The SO-DIMM slot is intended for memory modules.

1. Locate the SO-DIMM slot. Align the notch on the DIMM with the key on the slot and insert the DIMM into the slot.



2. Push the DIMM gently downwards until the slot levers click and lock the DIMM in place.



3. To uninstall the DIMM, flip the slot levers outwards and the DIMM will be released instantly.

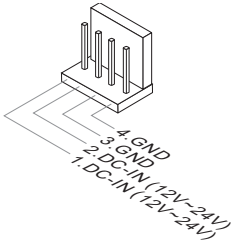
Important

You can barely see the golden finger if the DIMM is properly inserted in the DIMM slot.

Power Supply

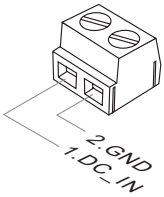
DC-In Power Connector: JPWR1 (For Apollo Lake)

This connector is used to provide power to the motherboard.



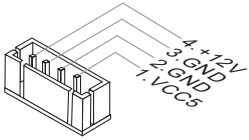
DC-In Power Connector: JPWR2 (For Apollo Lake-I)

This connector is used to provide power to the motherboard.



SATA Power Connector: JPW1

This connector is used to provide power to SATA devices.



Important

Make sure that all power connectors are connected to the power supply to ensure stable operation of the motherboard.

Rear Panel I/O

➤ DisplayPort

DisplayPort is a digital display interface standard. This connector is used to connect a monitor with DisplayPort inputs.

➤ HDMI Port

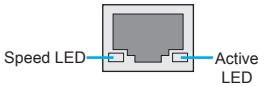
The High-Definition Multimedia Interface (HDMI) is an all-digital audio/video interface capable of transmitting uncompressed streams. HDMI supports all TV format, including standard, enhanced, or high-definition video, plus multi-channel digital audio on a single cable.

➤ USB 3.0 Port

The USB 3.0 port is backward-compatible with USB 2.0 devices and supports data transfer rate up to 5 Gbit/s (SuperSpeed).

➤ RJ45 GbE LAN Port

The standard single RJ45 LAN jack is provided for connection to the Local Area Network (LAN). You can connect a network cable to it.

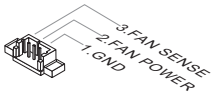


LED	LED Status	Description
Active LED	Off	No link
	Yellow	Linked
	Blinking	Data activity
Speed LED	Off	10 Mbps connection
	Green	100 Mbps connection
	Orange	1 Gbps connection

Connector

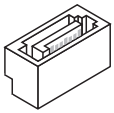
Fan Power Connector: SYSFAN1

The fan power connector supports system cooling fan with +12V. When connecting the wire to the connectors, always note that the red wire is the positive and should be connected to the +12V; the black wire is Ground and should be connected to GND. If the motherboard has a System Hardware Monitor chipset onboard, you must use a specially designed fan with speed sensor to take advantage of the CPU fan control.



Serial ATA Connector: SATA1

This connector is a high-speed Serial ATA interface port. Each connector can connect to one Serial ATA device.

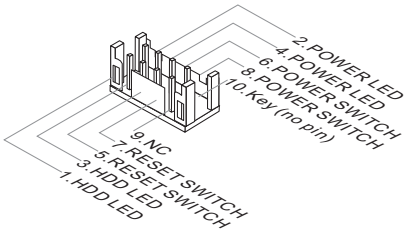


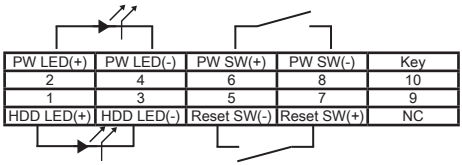
Important

Please do not fold the SATA cable into a 90-degree angle. Otherwise, data loss may occur during transmission.

Front Panel Connector: JFP1

This connector is provided for electrical connection to the front panel switches & LEDs and is compliant with Intel Front Panel I/O Connectivity Design Guide.



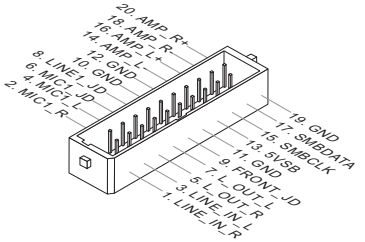


PW LED(+)	PW LED(-)	PW SW(+)	PW SW(-)	Key
2	4	6	8	10
1	3	5	7	9
HDD LED(+)	HDD LED(-)	Reset SW(-)	Reset SW(+)	NC

LED(+)	Voltage(V)	Current(mA)
Power	5	18.51
HDD	5	18.51

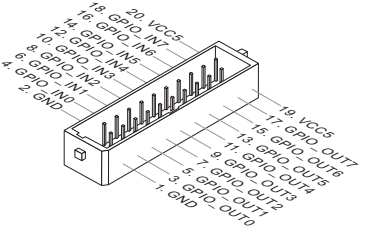
Audio/Amplifier/SMbus Connector: JAUD1

This connector allows you to connect the front panel audio. It also supports amplifier function to enhance audio performance and SMBus, known as I2C, for connecting System Management Bus (SMBus) interface. This connector is compliant with Intel Front Panel I/O Connectivity Design Guide.



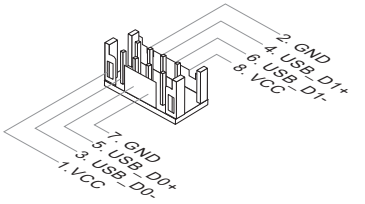
GPIO Connector: JGPIO1

This connector is provided for the General-Purpose Input/Output (GPIO) peripheral module.



USB 2.0 Header: JUSB1

This connector, compliant with Intel I/O Connectivity Design Guide, is ideal for connecting high-speed USB interface peripherals such as USB HDD, digital cameras, MP3 players, printers, modems and the like.

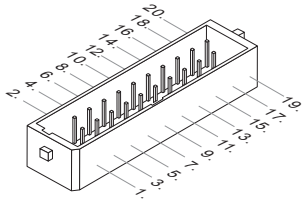


Important

Note that the pins of VCC and GND must be connected correctly to avoid possible damage.

Serial Port Connector: JCOM1/JCOM2/JCOM3

This connector is a 16550A high speed communications port that sends/receives 16 bytes FIFOs. You can attach serial devices to it through the optional serial port bracket.



JCOM1 Connector

COM1: RS-232/422/485 with 0V/5V/12V

RS-232

PIN	SIGNAL	DESCRIPTION
1	DCD	Data Carrier Detect
3	SIN	Signal In
5	SOUT	Signal Out
7	DTR	Data Terminal Ready
9	GND	Signal Ground
11	DSR	Data Set Ready
13	RTS	Request To Send
15	CTS	Clear To Send
17	VCC_COM1	Voltage select setting by jumper
19	NC	No Connection

RS-422

PIN	SIGNAL	DESCRIPTION
1	422 TXD-	Transmit Data, Negative
3	422 TXD+	Transmit Data, Positive
5	422 RXD+	Receive Data, Positive
7	422 RXD-	Receive Data, Negative
9	GND	Signal Ground
11	NC	No Connection
13	NC	No Connection
15	NC	No Connection
17	NC	No Connection
19	NC	No Connection

RS-485

PIN	SIGNAL	DESCRIPTION
1	485 TXD-	Transmit Data, Negative
3	485 TXD+	Transmit Data, Positive
5	NC	No Connection
7	NC	No Connection
9	GND	Signal Ground
11	NC	No Connection
13	NC	No Connection
15	NC	No Connection
17	NC	No Connection
19	NC	No Connection

COM2: RS-232 with 0V/5V/12V

RS-232

PIN	SIGNAL	DESCRIPTION
2	DCD	Data Carrier Detect
4	SIN	Signal In
6	SOUT	Signal Out
8	DTR	Data Terminal Ready
10	GND	Signal Ground
12	DSR	Data Set Ready
14	RTS	Request To Send
16	CTS	Clear To Send
18	VCC_COM1	Voltage select setting by jumper
20	NC	No Connection

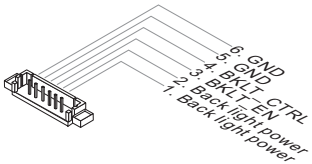
JCOM2/ 3 Connector
COM3~ 6: RS-232 with 0V/5V/12V

RS-232

PIN		SIGNAL	DESCRIPTION
1	2	DCD	Data Carrier Detect
3	4	SIN	Signal In
5	6	SOUT	Signal Out
7	8	DTR	Data Terminal Ready
9	10	GND	Signal Ground
11	12	DSR	Data Set Ready
13	14	RTS	Request To Send
15	16	CTS	Clear To Send
17	18	VCC_COM1	Voltage select setting by jumper
19	20	NC	No Connection

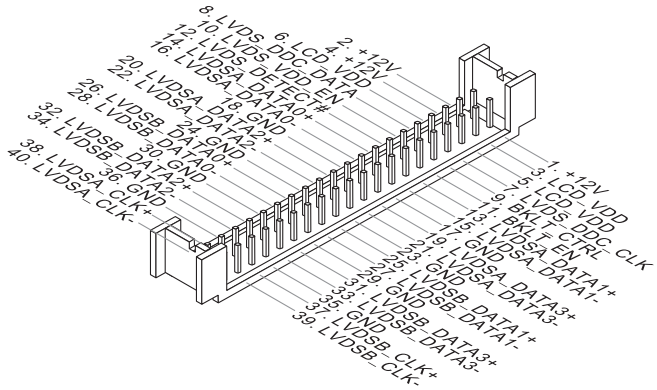
LVDS Inverter Connector: JINVDD1 / JINVDD2

The connector is provided for LCD backlight options.



LVDS Connector: JLVDS1 / JLVDS2

The LVDS (Low Voltage Differential Signal) connector provides a digital interface typically used with flat panels. After connecting an LVDS interface flat panel to the JLVDS1, be sure to check the panel datasheet and set the LVDS jumper to proper power voltage.

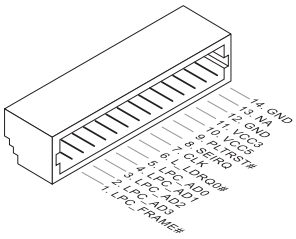


Important

Pin 12 is a detect pin. When using a customized LVDS cable, pin 12 should be a signal ground with a low impedance. Otherwise, LVDS will not function.

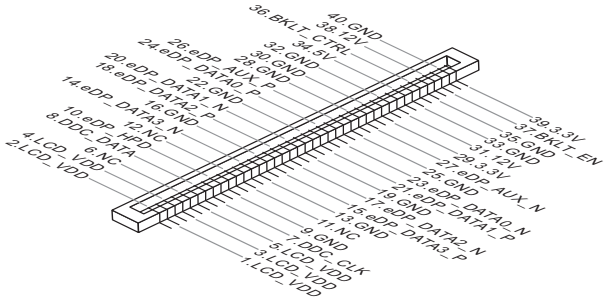
LPC Debug Port Connector: JLPC1 *(With TPM Support)*

This connector works as LPC debug port and supports TPM modules through an adapter.



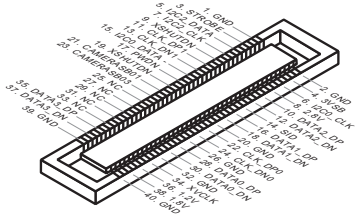
eDP Connector

This connector is for connecting the flat eDP cable.



MIPI-CSI 2.0 Connector

This slot is connecting the flat MIPI-CSI cable.



Jumper

Important

Avoid adjusting jumpers when the system is on; it will damage the motherboard.

Clear CMOS Jumper: JCMOS1

There is a CMOS RAM onboard that has a power supply from an external battery to keep the data of system configuration. With the CMOS RAM, the system can automatically boot OS every time it is turned on. If you want to clear the system configuration, set the jumper to clear data.

Normal Clear CMOS

Important

You can clear CMOS by shorting 2-3 pin while the system is off. Then return to 1-2 pin position. Avoid clearing the CMOS while the system is on; it will damage the motherboard.

AT/ATX Select Jumper: JAT1

This jumper allows users to select between AT and ATX power.

ATX AT

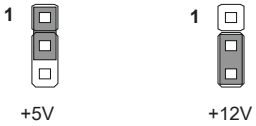
eDP Power Jumper: JEDP_VDD1

This jumper specifies the operation voltage of the eDP connector.

+5V +3V

Serial Port Power Jumper: JCOMP1

The jumper specifies the operation voltage of the specified serial port.



Serial Port Power Jumper: JCOMP2 / JCOMP3

The jumper specifies the operation voltage of the specified serial port.

LVDS Power Jumper: JVDD1 / JVDD2

Use this jumper to specify the operation voltage of the LVDS display.

LVDS Inverter Power Jumper: JINV1 / JINV2

Use this jumper to specify the operation voltage of the LVDS inverter.

JDNX1 Jumper: JDNX1

This jumper is designed only for debugging.

JNVM1 & JNVM2 Jumper: JNVM1 / JNVM2

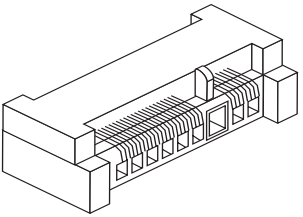
This jumper is designed only for debugging.

Slot

Mini-PCIe (Peripheral Component Interconnect Express) Slot

The Mini-PCIe slot is provided for WiFi modules, Bluetooth modules, TV tuner cards and other Mini-PCIe cards.

- **MINI_PCIE1** supports **Mini-PCIe** and **Nano-SIM** card.
- **MINI_PCIE2** supports **Mini-PCIe** and **mSATA** cards.



Important

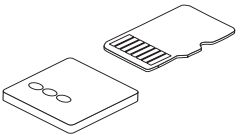
When adding or removing expansion cards, make sure that you unplug the power supply first. Meanwhile, read the documentation for the expansion card to configure any necessary hardware or software settings for the expansion card, such as jumpers, switches or BIOS configuration.

Nano SIM-Holder

This holder is for inseriting the Nano-SIM card.

Micro SD Card Slot

This slot is for inseriting the micro SD card.



3 BIOS Setup

This chapter provides information on the BIOS Setup program and allows users to configure the system for optimal use.

Users may need to run the Setup program when:

- An error message appears on the screen at system startup and requests users to run SETUP.
- Users want to change the default settings for customized features.

Important

- *Please note that BIOS update assumes technician-level experience.*
- *As the system BIOS is under continuous update for better system performance, the illustrations in this chapter should be held for reference only.*

Entering Setup

Power on the computer and the system will start POST (Power On Self Test) process. When the message below appears on the screen, press <DEL> or <F2> key to enter Setup.

Press <DEL> or <F2> to enter SETUP

If the message disappears before you respond and you still wish to enter Setup, restart the system by turning it OFF and On or pressing the RESET button. You may also restart the system by simultaneously pressing <Ctrl>, <Alt>, and <Delete> keys.

Important

The items under each BIOS category described in this chapter are under continuous update for better system performance. Therefore, the description may be slightly different from the latest BIOS and should be held for reference only.

Control Keys

← →	Select Screen
↑ ↓	Select Item
Enter	Select
+ -	Change Option
F1	General Help
F7	Previous Values
F9	Optimized Defaults
F10	Save & Exit
Esc	Exit

Getting Help

After entering the Setup menu, the first menu you will see is the Main Menu.

Main Menu

The main menu lists the setup functions you can make changes to. You can use the arrow keys (↑↓) to select the item. The on-line description of the highlighted setup function is displayed at the bottom of the screen.

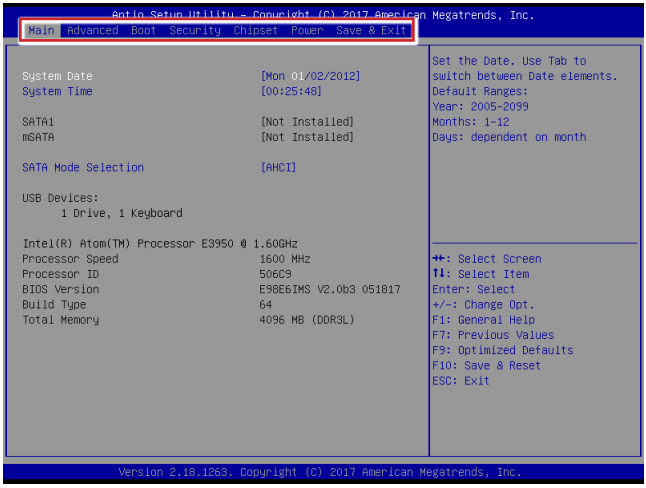
Sub-Menu

If you find a right pointer symbol appears to the left of certain fields that means a sub-menu can be launched from this field. A sub-menu contains additional options for a field parameter. You can use arrow keys (↑↓) to highlight the field and press <Enter> to call up the sub-menu. Then you can use the control keys to enter values and move from field to field within a sub-menu. If you want to return to the main menu, just press the <Esc >.

General Help <F1>

The BIOS setup program provides a General Help screen. You can call up this screen from any menu by simply pressing <F1>. The Help screen lists the appropriate keys to use and the possible selections for the highlighted item. Press <Esc> to exit the Help screen.

The Menu Bar



▸ **Main**

Use this menu for basic system configurations, such as time, date, etc.

▸ **Advanced**

Use this menu to set up the items of special enhanced features.

▸ **Boot**

Use this menu to specify the priority of boot devices.

▸ **Security**

Use this menu to set supervisor and user passwords.

▸ **Chipset**

This menu controls the advanced features of the onboard chipsets.

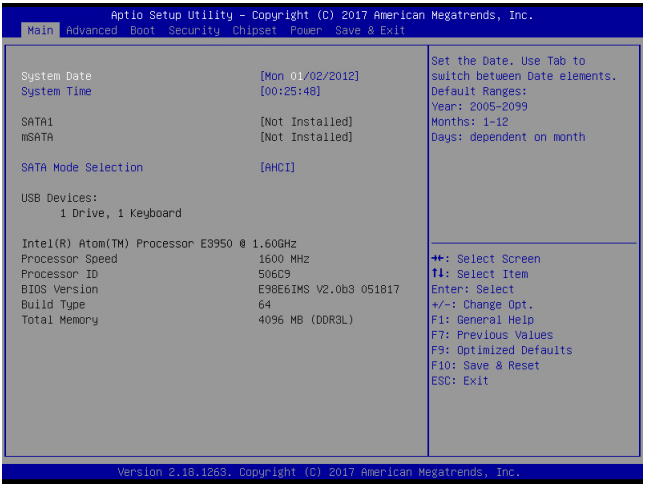
▸ **Power**

Use this menu to specify your settings for power management.

▸ **Save & Exit**

This menu allows you to load the BIOS default values or factory default settings into the BIOS and exit the BIOS setup utility with or without changes.

Main



▸System Date

This setting allows you to set the system date. The date format is <Day>, <Month> <Date> <Year>.

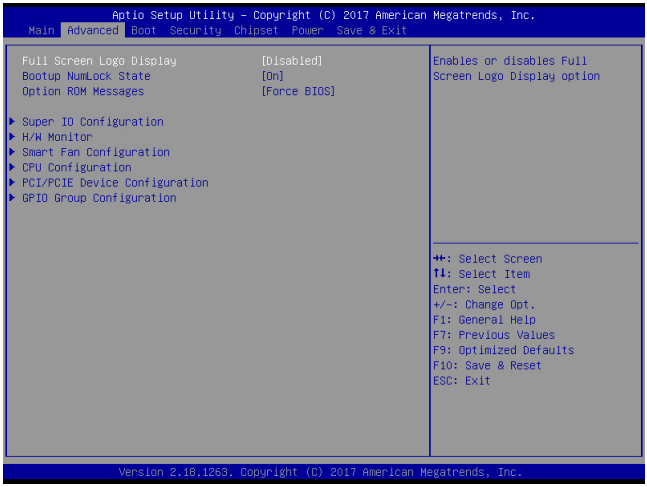
▸System Time

This setting allows you to set the system time. The time format is <Hour> <Minute> <Second>.

▸SATA Mode Selection

This setting specifies the SATA controller mode.

Advanced



▸Full Screen Logo Display

This BIOS feature determines if the BIOS should hide the normal POST messages with the motherboard or system manufacturer's full-screen logo.

When it is enabled, the BIOS will display the full-screen logo during the boot-up sequence, hiding normal POST messages.

When it is disabled, the BIOS will display the normal POST messages, instead of the full-screen logo.

Please note that enabling this BIOS feature often adds 2-3 seconds of delay to the booting sequence. This delay ensures that the logo is displayed for a sufficient amount of time. Therefore, it is recommended that you disable this BIOS feature for a faster boot-up time.

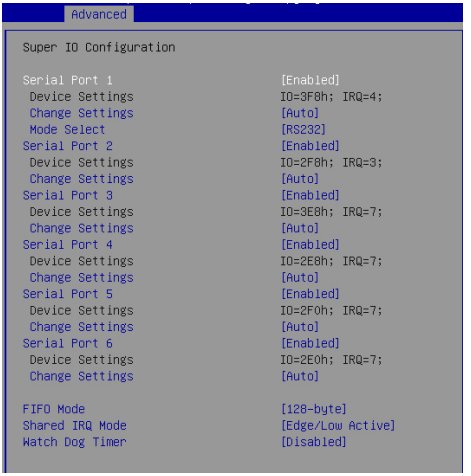
▸Bootup NumLock State

This setting is to set the Num Lock status when the system is powered on. Setting to [On] will turn on the Num Lock key when the system is powered on. Setting to [Off] will allow users to use the arrow keys on the numeric keypad.

▸Option ROM Messages

This item is used to determine the display mode when an optional ROM is initialized during POST. When set to [Force BIOS], the display mode used by AMI BIOS is used. Select [Keep Current] if you want to use the display mode of optional ROM.

▸Super IO Configuration



▸Serial Port 1/ 2/ 3/ 4/ 5/ 6

This setting enables/disables the specified serial port.

▸Change Settings

This setting is used to change the address & IRQ settings of the specified serial port.

▸Mode Select

Select an operation mode for the specified serial port.

▸FIFO Mode

This setting controls the FIFO data transfer mode.

▸Shared IRQ Mode

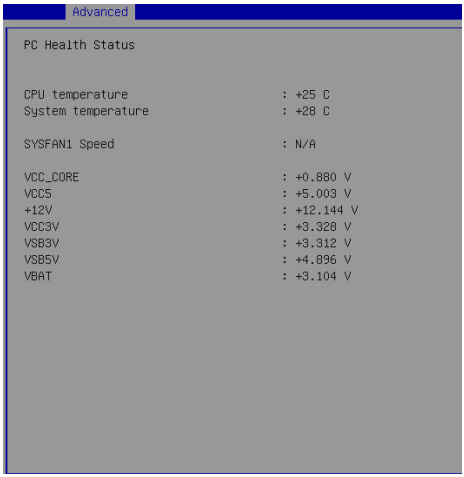
This setting provides the system with the ability to share interrupts among its serial ports.

▸ Watch Dog Timer

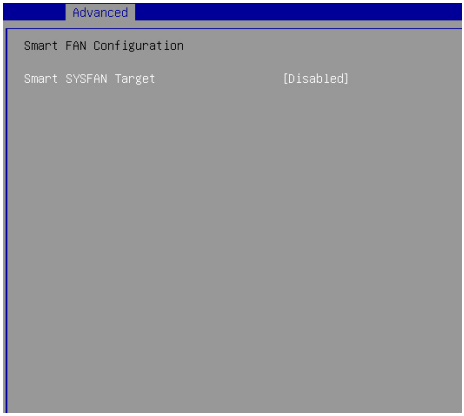
You can enable the system watch-dog timer, a hardware timer that generates a reset when the software that it monitors does not respond as expected each time the watch dog polls it.

▸H/W Monitor

These items display the current status of all monitored hardware devices/ components such as voltages, temperatures and all fans' speeds.



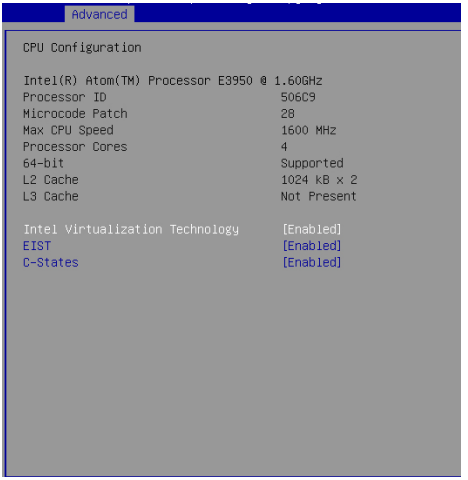
▸Smart Fan Configuration



▸Smart SYSFAN Target

This setting enables/disables the Smart Fan function. Smart Fan is an excellent feature which will adjust the CPU/system fan speed automatically depending on the current CPU/system temperature, avoiding the overheating to damage your system.

▸CPU Configuration



▸Intel Virtualization Technology

Virtualization enhanced by Intel Virtualization Technology will allow a platform to run multiple operating systems and applications in independent partitions. With virtualization, one computer system can function as multiple “Virtual” systems.

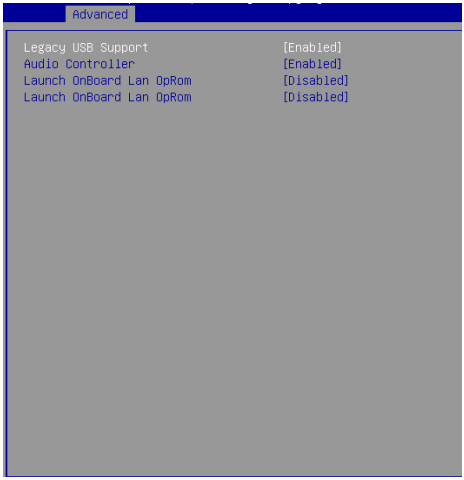
▸EIST

EIST (Enhanced Intel SpeedStep Technology) allows the system to dynamically adjust processor voltage and core frequency, which can result in decreased average power consumption and decreased average heat production. When disabled, the processor will return the actual maximum CPUID input value of the processor when queried.

▸C-States

This setting controls the C-States (CPU Power states).

▸PCI/PCIE Device Configuration



▸Legacy USB Support

Set to [Enabled] if you need to use any USB 1.1/2.0 device in the operating system that does not support or have any USB 1.1/2.0 driver installed, such as DOS and SCO Unix.

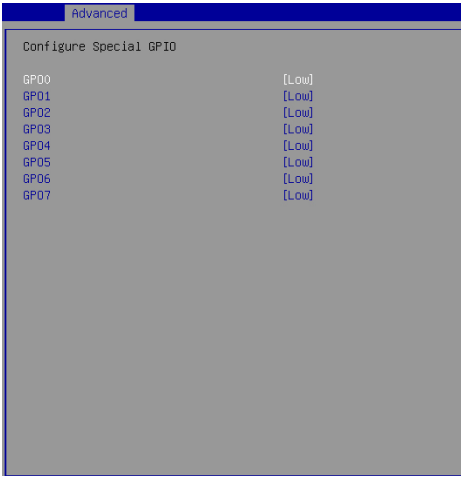
▸Audio Controller

This setting enables/disables the onboard audio controller.

▸Launch OnBoard LAN OpROM

These settings enable/disable the initialization of the onboard/onchip LAN Boot ROM during bootup. Selecting [Disabled] will speed up the boot process.

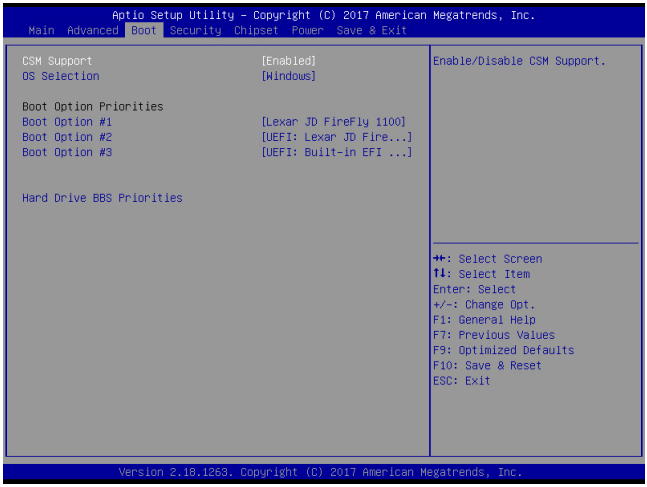
▸GPIO Group Configuration



▸GPO0 ~ GPO7

These settings control the operation mode of the specified GPIO.

Boot



▸CSM Support

This setting enables/disables the support for Compatibility Support Module, a part of the Intel Platform Innovation Framework for EFI providing the capability to support legacy BIOS interfaces.

▸OS Selection

This setting allows users to select the Operating System.

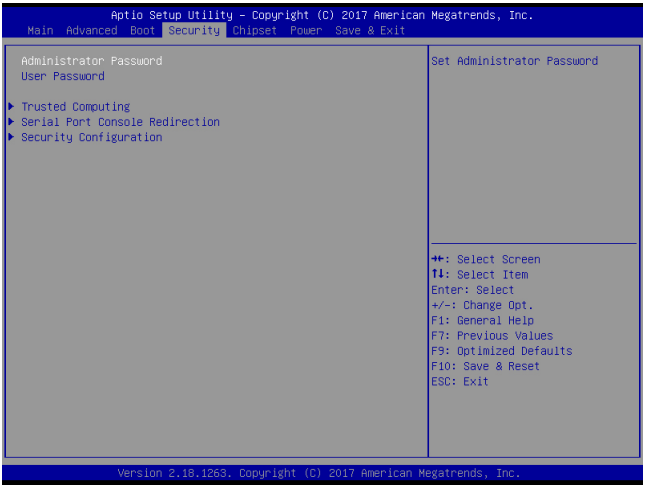
▸Boot Option Priorities

This setting allows users to set the sequence of boot devices where BIOS attempts to load the disk operating system.

▸Hard Drive BBS Priorities

This setting allows users to set the priority of the specified devices. First press <Enter> to enter the sub-menu. Then you may use the arrow keys (↑↓) to select the desired device, then press <+>, <-> or <PageUp>, <PageDown> key to move it up/down in the priority list.

Security



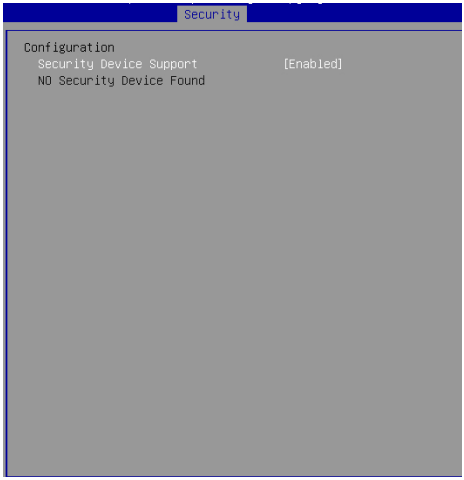
▸Administrator Password

Administrator Password controls access to the BIOS Setup utility.

▸User Password

User Password controls access to the system at boot and to the BIOS Setup utility.

▸**Trusted Computing**



▸**Security Device Support**

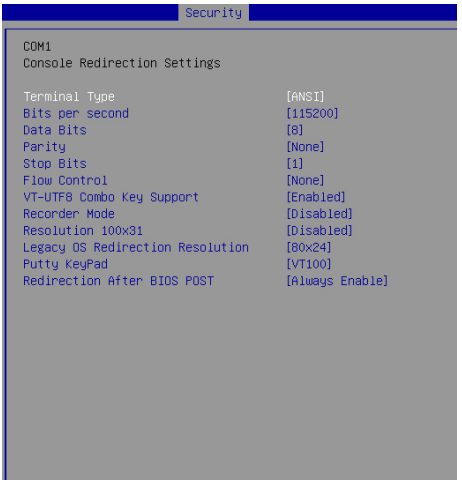
This setting enables/disables BIOS support for security device. When set to [Disable], the OS will not show security device. TCG EFI protocol and INT1A interface will not be available.

▸**Serial Port Console Redirection**

▸Console Redirection

Console Redirection operates in host systems that do not have a monitor and keyboard attached. This setting enables/disables the operation of console redirection. When set to [Enabled], BIOS redirects and sends all contents that should be displayed on the screen to the serial COM port for display on the terminal screen. Besides, all data received from the serial port is interpreted as keystrokes from a local keyboard.

▸Console Redirection Settings



▸Terminal Type

To operate the system's console redirection, you need a terminal supporting ANSI terminal protocol and a RS-232 null modem cable connected between the host system and terminal(s). This setting specifies the type of terminal device for console redirection.

▸ Bits per second, Data Bits, Parity, Stop Bits

This setting specifies the transfer rate (bits per second, data bits, parity, stop bits) of Console Redirection.

▸Flow Control

Flow control is the process of managing the rate of data transmission between two nodes. It's the process of adjusting the flow of data from one device to another to ensure that the receiving device can handle all of the incoming data. This is particularly important where the sending device is capable of sending data much faster than the receiving device can receive it.

▸**VT-UTF8 Combo Key Support**

This setting enables/disables the VT-UTF8 combination key support for ANSI/VT100 terminals.

▸**Recorder Mode, Resolution 100x31**

These settings enable/disable the recorder mode and the resolution 100x31.

▸ **Legacy OS Redirection Resolution**

This setting specifies the redirection resolution of legacy OS.

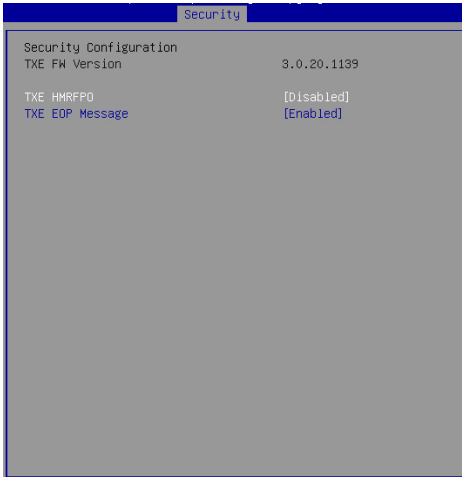
▸**Putty Keypad**

PuTTY is a terminal emulator for Windows. This setting controls the numeric keypad for use in PuTTY.

▸**Redirection After BIOS POST**

This setting determines whether or not to keep terminals' console redirection running after the BIOS POST has booted.

▸**Security Configuration**



▸**TXE FW Version**

The setting shows the firmware information of the Intel Trusted Execution Engine (TXE).

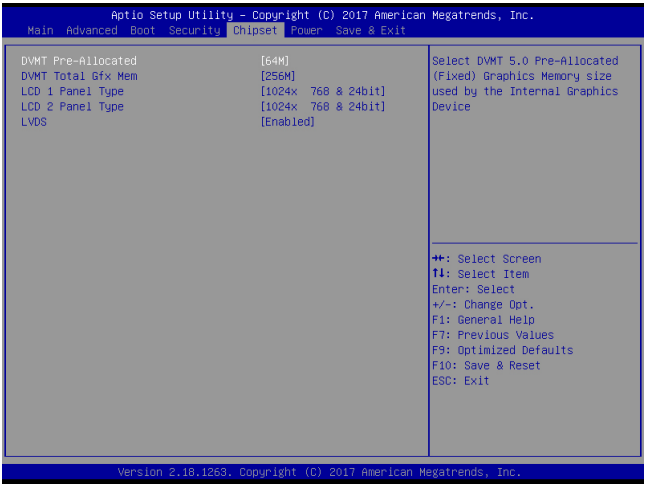
▸**TXE HMRFPO**

The setting enables/disables TXE HMRFPO (Host ME Region Flash Protection Override).

▸**TXE EOP Message**

This setting determines whether or not to send EOP (Exchange Online Protection) message before entering OS.

Chipset



▸DVMT Pre-Allocated

This setting defines the DVMT pre-allocated memory. Pre-allocated memory is the small amount of system memory made available at boot time by the system BIOS for video. Pre-allocated memory is also known as locked memory. This is because it is "locked" for video use only and as such, is invisible and unable to be used by the operating system.

▸DVMT Total Gfx Mem

This setting specifies the memory size for DVMT.

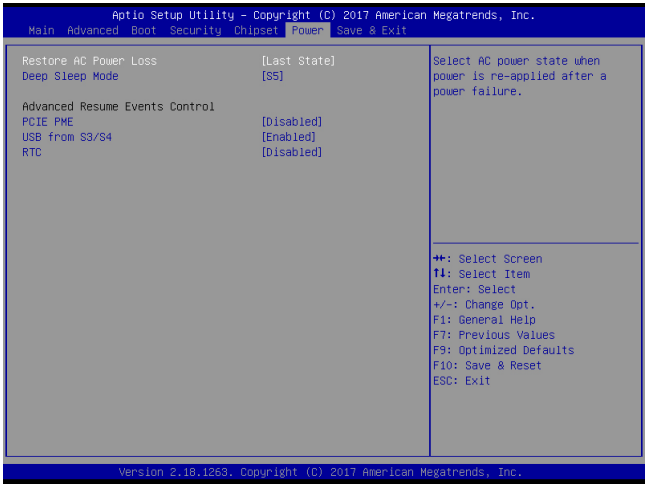
▸LCD 1 / 2 Panel Type

This setting specifies the LCD panel type.

▸LVDS

This setting enables/disables LVDS.

Power



▸Restore AC Power Loss

This setting specifies whether your system will reboot after a power failure or interrupt occurs. Available settings are:

[Power Off]	Leaves the computer in the power off state.
[Power On]	Leaves the computer in the power on state.
[Last State]	Restores the system to the previous status before power failure or interrupt occurred.

▸Deep Sleep Mode

The setting enables/disables the Deep S5 power saving mode. S5 is almost the same as G3 Mechanical Off, except that the PSU still supplies power, at a minimum, to the power button to allow return to S0. A full reboot is required. No previous content is retained. Other components may remain powered so the computer can “wake” on input from the keyboard, clock, modem, LAN, or USB device.

**** Advanced Resume Events Control ****

▸PCIE PME

This field specifies whether the system will be awakened from power saving modes when activity or input signal of onboard PCIE PME is detected.

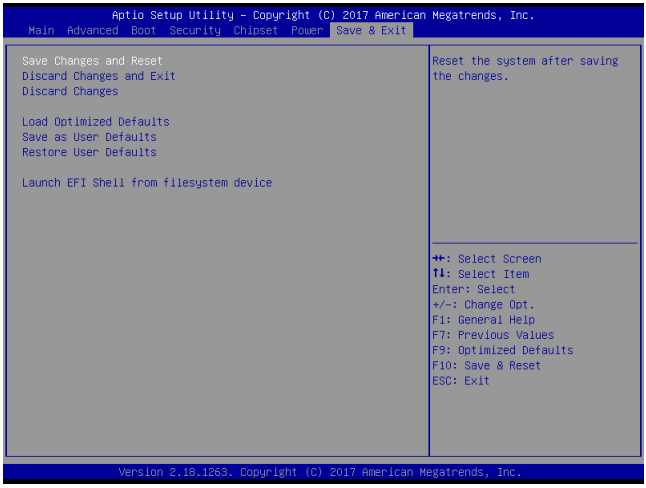
▸**USB from S3/S4**

The item allows the activity of the USB device to wake up the system from S3/S4 sleep state.

▸**RTC**

When [Enabled], your can set the date and time at which the RTC (real-time clock) alarm awakens the system from suspend mode.

Save & Exit



▸**Save Changes and Reset**

Save changes to CMOS and reset the system.

▸**Discard Changes and Exit**

Abandon all changes and exit the Setup Utility.

▸**Discard Changes**

Abandon all changes.

▸**Load Optimized Defaults**

Use this menu to load the default values set by the motherboard manufacturer specifically for optimal performance of the motherboard.

▸**Save as User Defaults**

Save changes as the user's default profile.

▸**Restore User Defaults**

Restore the user's default profile.

▸**Launch EFI Shell from filesystem device**

This setting helps to launch the EFI Shell application from one of the available file system devices.

Appendix
GPIO WDT BKL Programming

This appendix provides WDT (Watch Dog Timer), GPIO (General Purpose Input/ Output) and LVDS Backlight programming guide.

Abstract

Abstract

In this document, code examples based on C programming language are provided for customer interest. **Inportb**, **Outportb**, **Inportl** and **Outportl** are basic functions used for access IO ports and defined as following.

Inportb: Read a single 8-bit I/O port.
Outportb: Write a single byte to an 8-bit port.
Inportl: Reads a single 32-bit I/O port.
Outportl: Write a single long to a 32-bit port.

General Purposed IO – GPIO/DIO

1. General Purposed IO – GPIO/DIO

The GPIO port configuration addresses are listed in the following table:

Name	IO Port	IO address	Name	IO Port	IO address
N_GPI0	0x42	Bit 0	**N_GPO0**	0x11	Bit 0
N_GPI1	0x42	Bit 1	**N_GPO1**	0x11	Bit 1
N_GPI2	0x42	Bit 2	**N_GPO2**	0x11	Bit 2
N_GPI3	0x42	Bit 3	**N_GPO3**	0x11	Bit 3
N_GPI4	0x42	Bit 4	**N_GPO4**	0x11	Bit 4
N_GPI5	0x42	Bit 5	**N_GPO5**	0x11	Bit 5
N_GPI6	0x42	Bit 6	**N_GPO6**	0x11	Bit 6
N_GPI7	0x42	Bit 7	**N_GPO7**	0x11	Bit 7

Note: GPIO should be accessed through controller device **0x6E** on SMBus. The associated access method in examples (**SMBus_ReadByte**, **SMBus_WriteByte**) are provided in part 4.

1.1 Set output value of GPO

1. Read the value from GPO port.
2. Set the value of GPO address.
3. Write the value back to GPO port.

Example: Set **N_GPO0** output "high"

```
val =SMBus_ReadByte (0x6E, 0x11);  // Read value from N_GPO0 port through SMBus.
val = val | (1<<0);                // Set N_GPO0address (bit 0) to 1 (output "high").
SMBus_WriteByte (0x6E, 0x11, val); // Write back to N_GPO0 port through SMBus.
```

Example: Set **N_GPO1** output "low"

```
val = SMBus_ReadByte (0x6E, 0x11); // Read value from N_GPO1 port through SMBus..
val = val & (~(1<<1));             // Set N_GPO1 address (bit 1) to 0 (output "low").
SMBus_WriteByte (0x6E, 0x11, val); // Write back to N_GPO1 port through SMBus.
```

1.2 Read input value from GPI:

1. Read the value from GPI port.
2. Get the value of GPI address.

Example: Get **N_GPI2** input value.

```
val = SMBus_ReadByte (0x6E, 0x42); // Read value from N_GPI2 port through SMBus.
val = val & (1<<2);                // Read N_GPI2 address (bit 2).
if (val)    printf ("Input of  N_GPI2  is High");
else        printf ("Input of  N_GPI2  is Low");
```

Example: Get **N_GPI6** input value.

```
val = SMBus_ReadByte (0x6E, 0x42); // Read value from N_GPI6 port through SMBus.
val = val & (1<<6);                // Read N_GPI6 address (bit 6).
if (val)    printf ("Input of  N_GPI6  is High");
else        printf ("Input of  N_GPI6  is Low");
```

Watchdog Timer – WDT

2. Watchdog Timer – WDT

The base address (WDT_BASE) of WDT configuration registers is 0xA10.

2.1 Set WDT Time Unit

```
val = Inportb (WDT_BASE + 0x05);        // Read current WDT setting
val = val | 0x08;                       // minute mode. val = val & 0xF7 if second mode
Outportb (WDT_BASE + 0x05, val);        // Write back WDT setting
```

2.2 Set WDT Time

```
Outportb (WDT_BASE + 0x06, Time);       // Write WDT time, value 1 to 255.
```

2.3 Enable WDT

```
val = Inportb (WDT_BASE + 0x0A);        // Read current WDT_PME setting
val = val | 0x01;                       // Enable WDT OUT: WDOUT_EN (bit 0) set to 1.
Outportb (WDT_BASE + 0x0A, val);        // Write back WDT setting.
val = Inportb (WDT_BASE + 0x05);        // Read current WDT setting
val = val | 0x20;                       // Enable WDT by set WD_EN (bit 5) to 1.
Outportb (WDT_BASE + 0x05, val);        // Write back WDT setting.
```

2.4 Disable WDT

```
val = Inportb (WDT_BASE + 0x05);        // Read current WDT setting
val = val & 0xDF;                       // Disable WDT by set WD_EN (bit 5) to 0.
Outportb (WDT_BASE + 0x05, val);        // Write back WDT setting.
```

2.5 Check WDT Reset Flag

If the system has been reset by WDT function, this flag will set to 1.

```
val = Inportb (WDT_BASE + 0x05);        // Read current WDT setting.
val = val & 0x40;                       // Check WDTMOUT_STS (bit 6).
if (val)    printf ("timeout event occurred");
else        printf ("timeout event not occurred");
```

2.6 Clear WDT Reset Flag

```
val = Inportb (WDT_BASE + 0x05);        // Read current WDT setting
val = val | 0x40;                       // Set 1 to WDTMOUT_STS (bit 6);
Outportb (WDT_BASE + 0x05, val);        // Write back WDT setting
```

LVDS Backlight Brightness Control

3. LVDS Backlight Brightness Control

The LVDS controller support 17 level of backlight brightness value from 0 (30%) to 16 (100%) and it is accessible through SMBus. The associated access method (**SMBus_ReadByte**, **SMBus_WriteByte**) are provided in part 4.

3.1 Set the Level of LVDS Backlight

1. Write **0xED** into address **0x7F** on SMBus device **0x42**.
2. Write desired backlight level from 0x0 (30%) to 0x10 (100%) into address **0x6E** on SMBus device **0x42**.

Example: Set LVDS backlight level to 0x10 (100%)

SMBus_WriteByte (0x42, 0x7F, 0xED);

SMBus_WriteByte (0x42, 0x6E, **0x10**); // Set brightness to 100%

3.2 Read the Level of LVDS Backlight

1. Write **0xED** into address **0x7F** on SMBus device **0x42**.
2. Read current backlight level from address **0x6E** on SMBus device **0x42**.

Example: Get LVDS backlight level

SMBus_WriteByte (0x42, 0x7F, 0xED);

BKL_Value = SMBus_ReadByte (0x42, 0x6E);

SMBus Access

4. SMBus Access

The base address of SMBus must be known before access. The relevant bus and device information are as following.

```
#define IO_SC               0xCF8
#define IO_DA               0xCFC
#define PCIBASEADDRESS      0x80000000
#define PCI_BUS_NUM         0
#define PCI_DEV_NUM         31
#define PCI_FUN_NUM         1
```

4.1 Get SMBus Base Address

```
int SMBUS_BASE;
int DATA_ADDR = PCIBASEADDRESS + (PCI_BUS_NUM<<16) +
                                 (PCI_DEV_NUM<<11) +
                                 (PCI_FUN_NUM<<8);

Outportl (DATA_ADDR + 0x20, IO_SC);
SMBUS_BASE = Inportl (IO_DA) & 0xfffffff0;
```

4.2 SMBus_ReadByte (char DEVID, char offset)

Read the value of OFFSET from SMBus device DEVID.

```
Outportb (LOWORD (SMBUS_BASE), 0xFE);
Outportb (LOWORD (SMBUS_BASE) + 0x04, DEVID + 1); //out Base + 04, (DEVID + 1)
Outportb (LOWORD (SMBUS_BASE) + 0x03, OFFSET);   //out Base + 03, OFFSET
Outportb (LOWORD (SMBUS_BASE) + 0x02, 0x48);     //out Base + 02, 48H
mdelay (20);                                     //delay 20ms to let data ready
while ((Inportl (SMBUS_BASE) & 0x01) != 0);      //wait SMBus ready
SMB_DATA = Inportb (LOWORD (SMBUS_BASE) + 0x05); //input Base + 05
```

4.3 SMBus_WriteByte (char DEVID, char offset, char DATA)

Write DATA to OFFSET on SMBus device DEVID.

```
Outportb (LOWORD (SMBUS_BASE), 0xFE);
Outportb (LOWORD (SMBUS_BASE) + 0x04, DEVID);    //out Base + 04, (DEVID)
Outportb (LOWORD (SMBUS_BASE) + 0x03, OFFSET);   //out Base + 03, OFFSET
Outportb (LOWORD (SMBUS_BASE) + 0x05, DATA);     //out Base + 05, DATA
Outportb (LOWORD (SMBUS_BASE) + 0x02, 0x48);     //out Base + 02, 48H
mdelay (20);                                     //wait 20ms
```