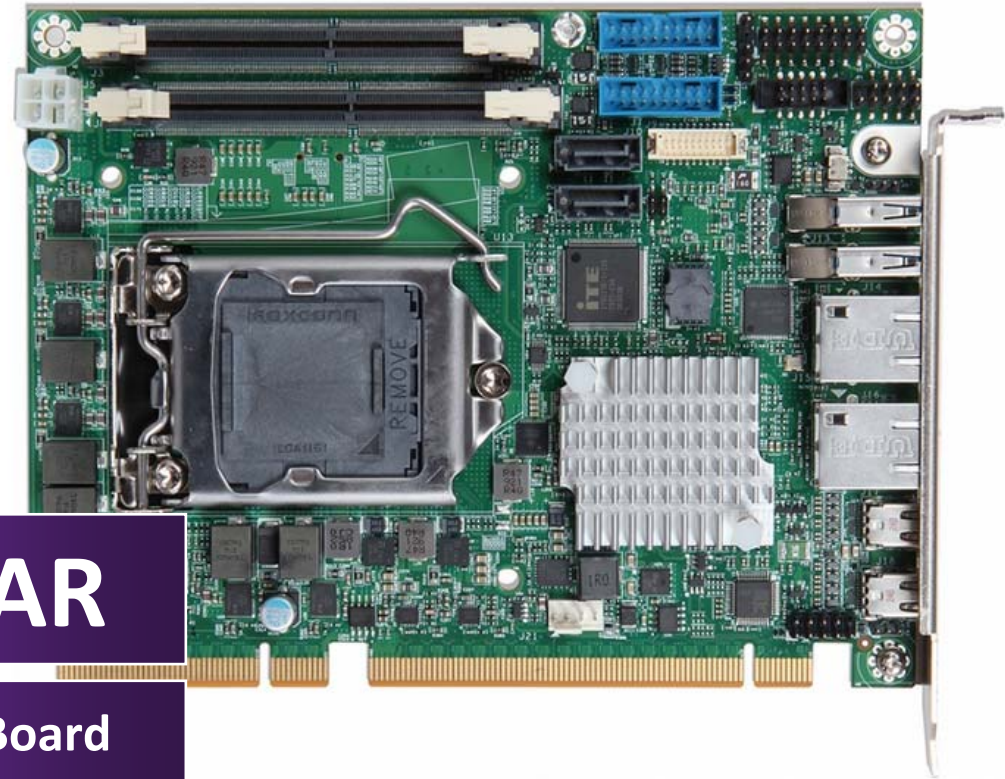


ROBO-6912VG2AR



ROBO-6912VG2AR

Half size PICMG 1.3 Single Host Board

Version 1.0

ROBO-6912VG2AR

Revision History

R1.0	Preliminary

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Preface

This user's guide provides information about the components, features, connectors and BIOS Setup menus available on the ROBO-6912VG2AR. This document should be referred to when designing PICMG 1.3 application. The other reference documents that should be used include the following:

- ✧ Intel Coffee Lake-S Design Guide
- ✧ Intel Coffee Lake-S Specification

Please contact Portwell Sales Representative for above documents.

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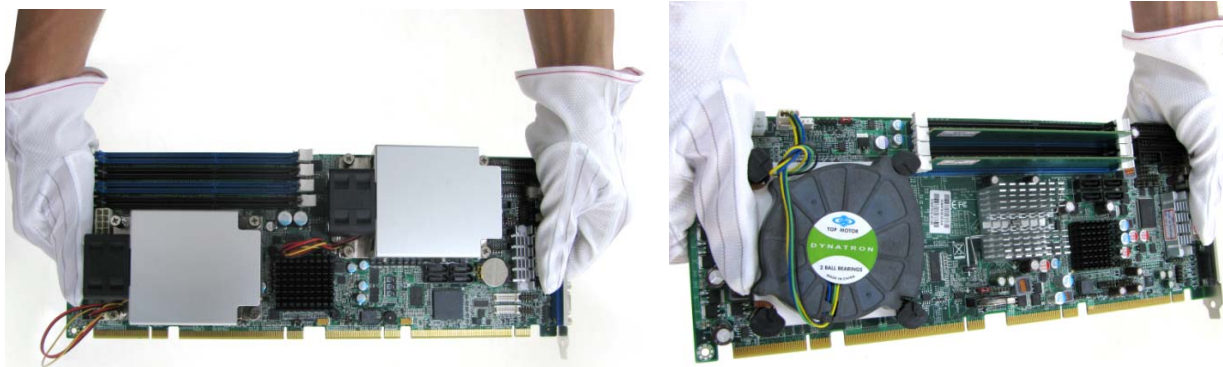
Notice

SBC Handling and Installation Notice

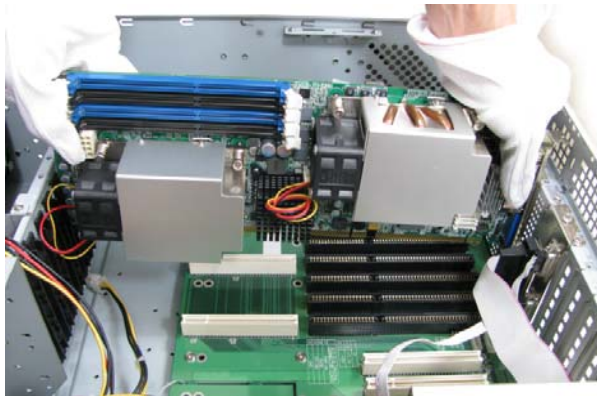
■ Handling and Installing SBC

Caution: Do not just hold any single side of the SBC; hold evenly on both sides!

- Heavy processor cooler may bend the SBC when SBC being held just on one side.
- The bending may cause soldering or components damaged.



ROBO-6912VG2AR



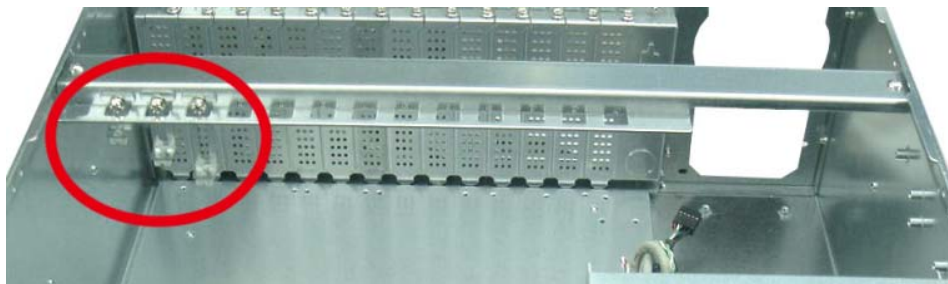
■ Fix your SBC in System

Caution: Suggest your S.I or vendor to use a metal bracket to hold/fix the desktop or server grade SBC to avoid the vibration damage during transportation. Heavy processor cooler may bend the SBC when systems are during transportation without any holder.

Example:

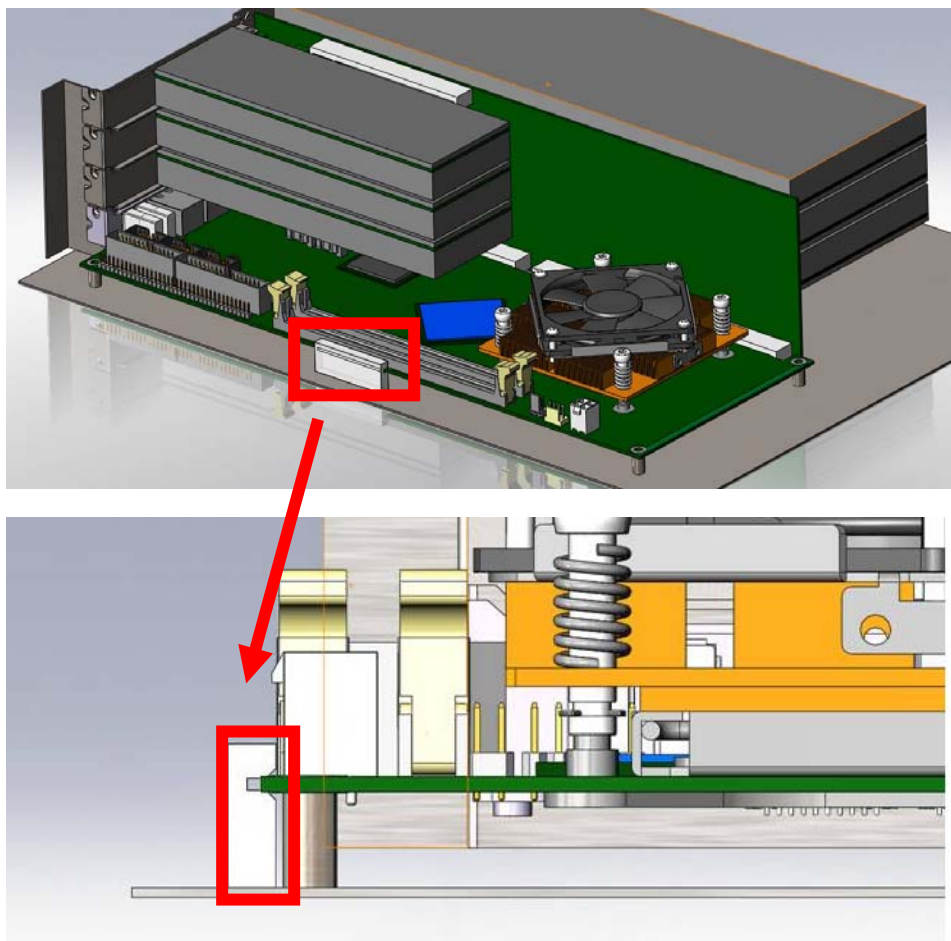
- 4U chassis :

→ Use L type metal or plastic or rubber bracket to hold SBC.



ROBO-6912VG2AR

- 2U or 1U chassis: a mental bracket on the bottom of chassis to balance and support SBC from bending.



1 Introduction

ROBO-6912VG2AR, a Half size PICMG 1.3 Single Host Board (SHB) with the latest Intel 8th Generation Core processors supported from E3 class Xeon processors to Core i3 processors. Portwell's ROBO-6912VG2AR implements flexible PCI Express Gen 3 expansion by one PCI Express x16 or two PCI Express x 8 or one PCI Express x8 and two PCI Express x4 with dedicated processor sku, which is ideal for a range of applications, such as Industrial Automation, Digital Signage, and Medical.

ROBO-6912VG2AR adopt Intel C246 and Q370 PCH. Providing up to 64GB DDR4 system memory supported with ECC or non-ECC option on SODIMM sockets. ROBO-6912VG2AR with the 8th generation Intel® processor family features and integrated, enhanced graphics engine which provides significant 3D performance, up to DirectX® 12. It supports triple display function via dual mini DP ports and one DVI-D port. Rich I/O functions are also provided by ROBO-6912VG2AR single host board, which is 4x USB 3.0, 2x USB 3.1 (on bracket), 2x SATA III ports, 1x smart COM ports which select RS232/422/485 mode by bios adjustment, and dual Intel GbE LAN ports. It also provide one mSATA socket for storage use.

For the industries who already have installed based systems, ROBO-6912VG2AR not only provides a way to upgrade to use the latest Intel processors, but also supporting legacy element such as Serial port, and flexible PCI Express combination for add-on cards.

2 Specifications

Main Processor	◆ Intel® Coffee Lake –S Core™ i 8x00/Xeon E3-21xx series Processors
System BIOS	◆ AMI UEFI BIOS
Main Memory	◆ Up to 64 GB ECC or non-ECC DDR4 on two SODIMM sockets. Supports dual channel DDR4 2133/2400 MHz
Graphics	◆ Controller: Intel® Gfx Gen 9, HD graphics ◆ DVI-D: Resolution up to 1920 x 1200 @ 60Hz ◆ Mini DP: Resolution up to 4096 x 2304 @ 60Hz
Expansion Interface	◆ From CPU: 1x PCI Express x16 or 2x PCI Express x8 or 1x PCI Express x8 + 2x PCI Express x4 by jumper setting (Gen3 up to 8.0 GT/s) ◆ From PCH: 1x PCI Express x4 or 4x PCI Express x1 by different bios support (Gen 3 up to 8.0 GT/s)
SATA Interface	◆ Two on-board SATA III ports (SATA 6Gb/s)
Input/Output	◆ Serial Ports: 1x RS-232/422/485 selectable by bios ◆ USB Port: 2x USB 3.1 on bracket, 4x USB 3.0 on board header ◆ GPIO connector: N/A ◆ Audio Interface: Mic-In / Line-Out / Line-in (on-board header)
Ethernet	◆ Supports dual 10/100/1000 Mbps Ethernet port (s) via PCI Express x1 interface by Intel WGI219LM and WGI210AT controller ◆ Dual RJ45 connector on bracket
High Drive GPIO	◆ N/A

ROBO-6912VG2AR

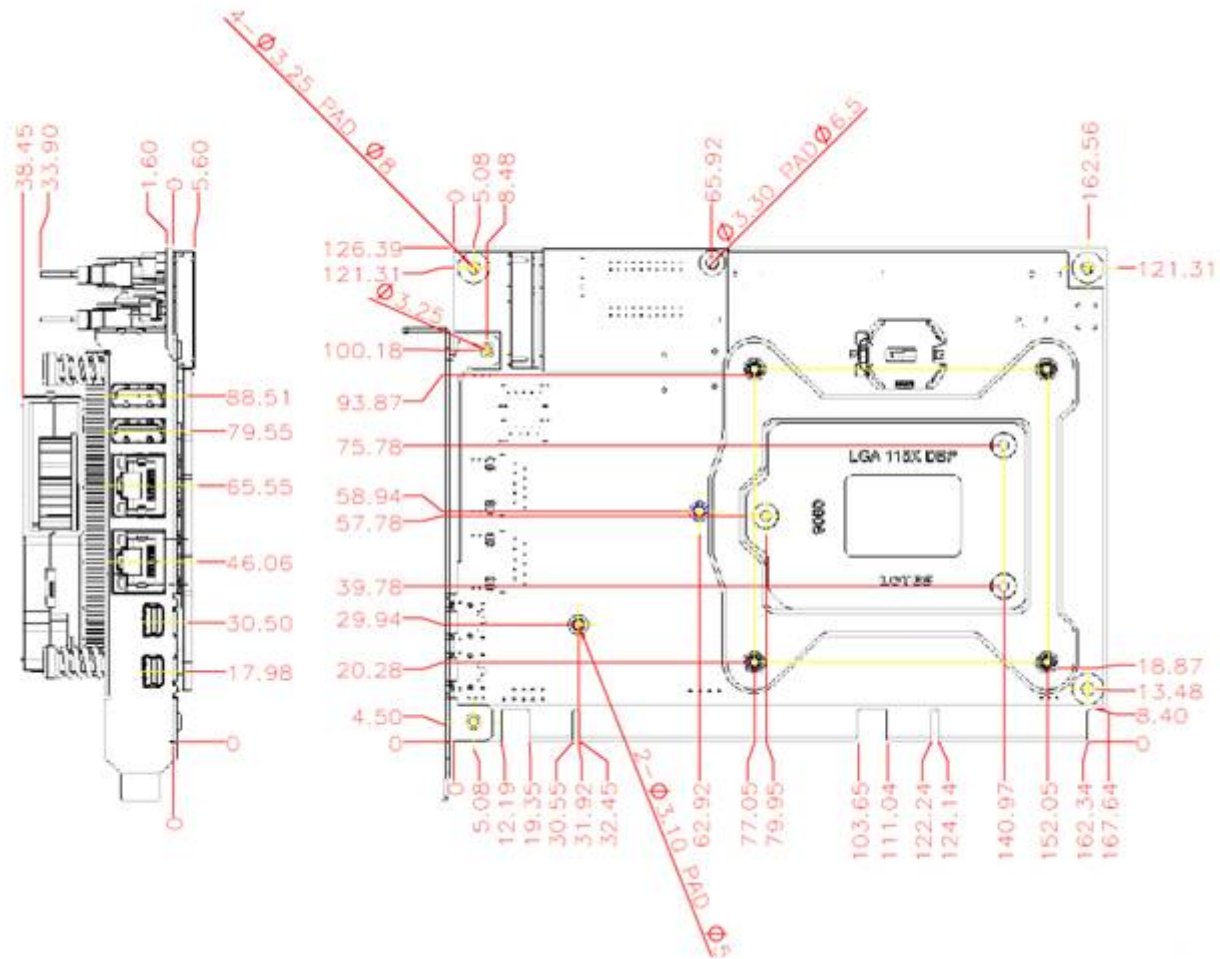
Mechanical and environmental specifications	<ul style="list-style-type: none">◆ Operating temperature: 0 ~ 60° C◆ Storage temperature:-20 ~ 80° C◆ Humidity: 5 ~ 90% non-condensing◆ Power supply voltage: ATX◆ Board size: 167.64mm x 126.39mm, 6.6" (L) x 4.98" (W)
---	---

2.1 Supported Operating Systems

The ROBO-6912VG2AR supports the following operating systems.

- ✧ Windows 10 full support
- ✧ Kernel.org Distribution

2.2 Mechanical Dimensions



2.3 Power Consumption

CPU Type	Intel® Core™ i7-8700 CPU @ 3.20 GHz
SBC BIOS	Portwell, Inc. ROBO_6912VG2AR BIOS Rev.: 0.0.3 (09162019)
Memory	Waris DDR4 SO-DIMM 2133/16GB *2
VGA Card	Onboard, Intel®UHD Graphics 630
VGA Driver	Intel®UHD Graphics 630, version: 26.20.100.7063
LAN I219 Card	Onboard, Intel®Ethernet Connection(7) I219-LM
LAN I219 Driver	Intel®Ethernet Connection(7) I219-LM, version: 12.17.10.8
LAN I210 Card	Onboard, Intel® I210 Gigabit Network Connection
LAN I210 Driver	Intel® I210 Gigabit Network Connection, version: 12.12.226.0
LAN I210 FW	3.25
Audio Card	Onboard, Realtek High Definition Audio
Audio Driver	Realtek High Definition Audio, version:6.0.8720.1
Chip Driver	8th Gen Intel®Core™, version: 10.1.14.7
USB3.0 Driver	Intel® USB3.1 eXtensible Host Controller-1.10(Microsoft), version:10.0.18362.1
EC Version	R00.E03
CPU ID	000906EA
Microcode Patch	000000B4
CDROM	LG GH24NS95
Power Supply	PLUTO-D5001PJ

ROBO-6912VG2AR

Backplane	PBPE-07A-MED
Boot Mode Select	UEFI mode

<i>Item</i>	<i>Power ON</i>	<i>Full Loading 10Min</i>	<i>Full Loading 30Min</i>
CPU +12V	0.6A	6.1A	6.2A
System +12V	1.1A	1.7A	1.6A
System +3.3V	0.9A	1.0A	1.2A
System +5V	0.3A	0.3A	0.3A
System+ Device +12V	1.9A	2.3A	2.2A
System+ Device +5V	0.5A	0.7A	0.6A
CPU +Device +12V	0.6A	6.1A	6.4A
USB3 Loading Test (J14)	4.92V / 1.1A		
USB3 Loading Test (J13)	4.92V / 1.0A		
USB3 Loading Test (J1 up)	4.87V / 1.1A		
USB3 Loading Test (J1 down)	4.87V / 1.1A		
USB3 Loading Test (J7 up)	4.87V / 1.1A		
USB3 Loading Test (J7 down)	4.88V / 1.1A		

2.4 Environmental Specifications

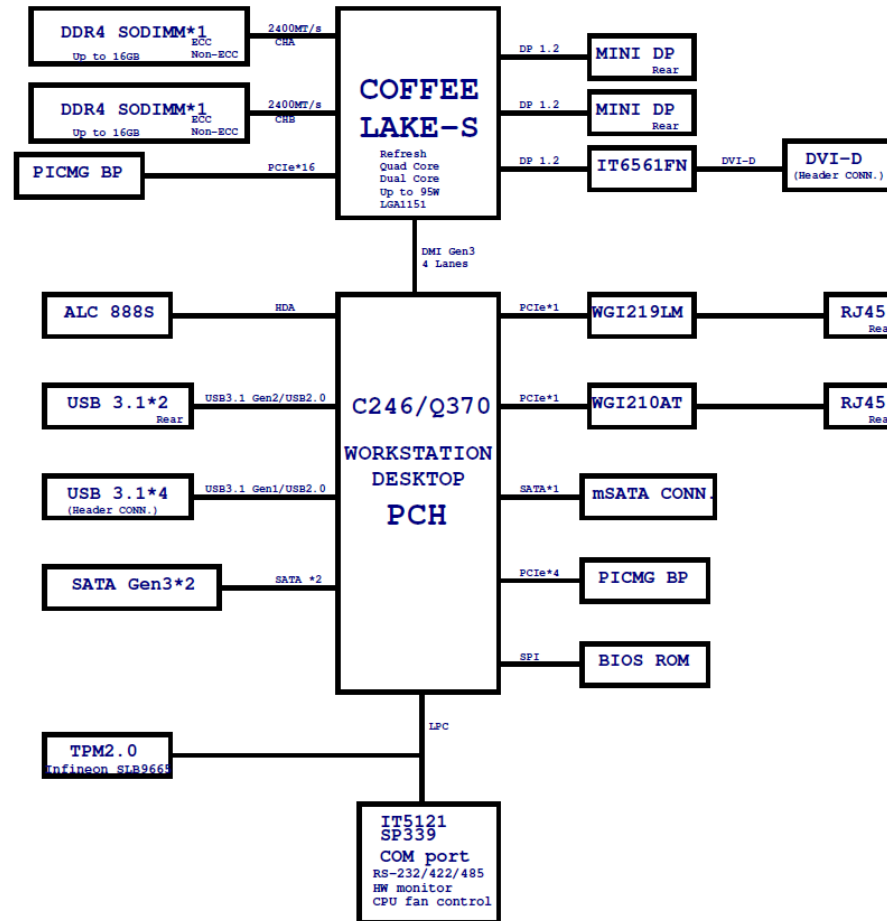
Storage Temperature : -20~80°C

Operation Temperature : 0~60°C

Storage Humidity : 5~90%

Operation Humidity: 10~90%

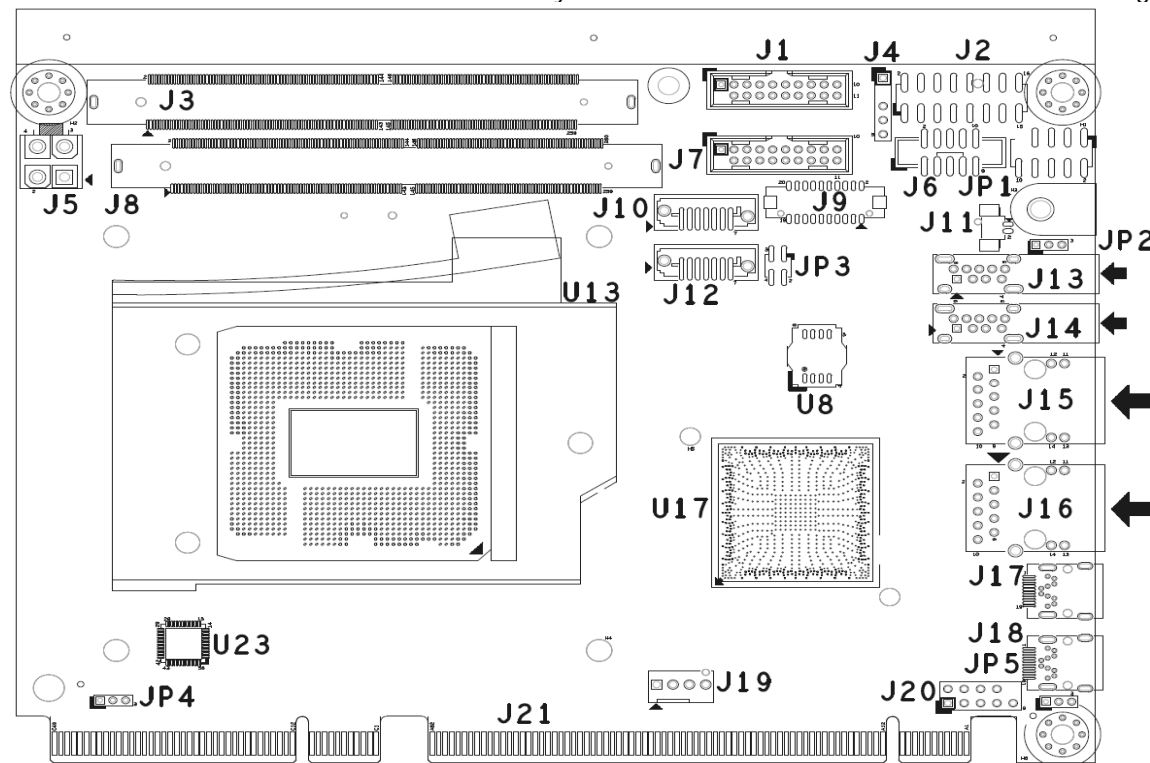
Block Diagram

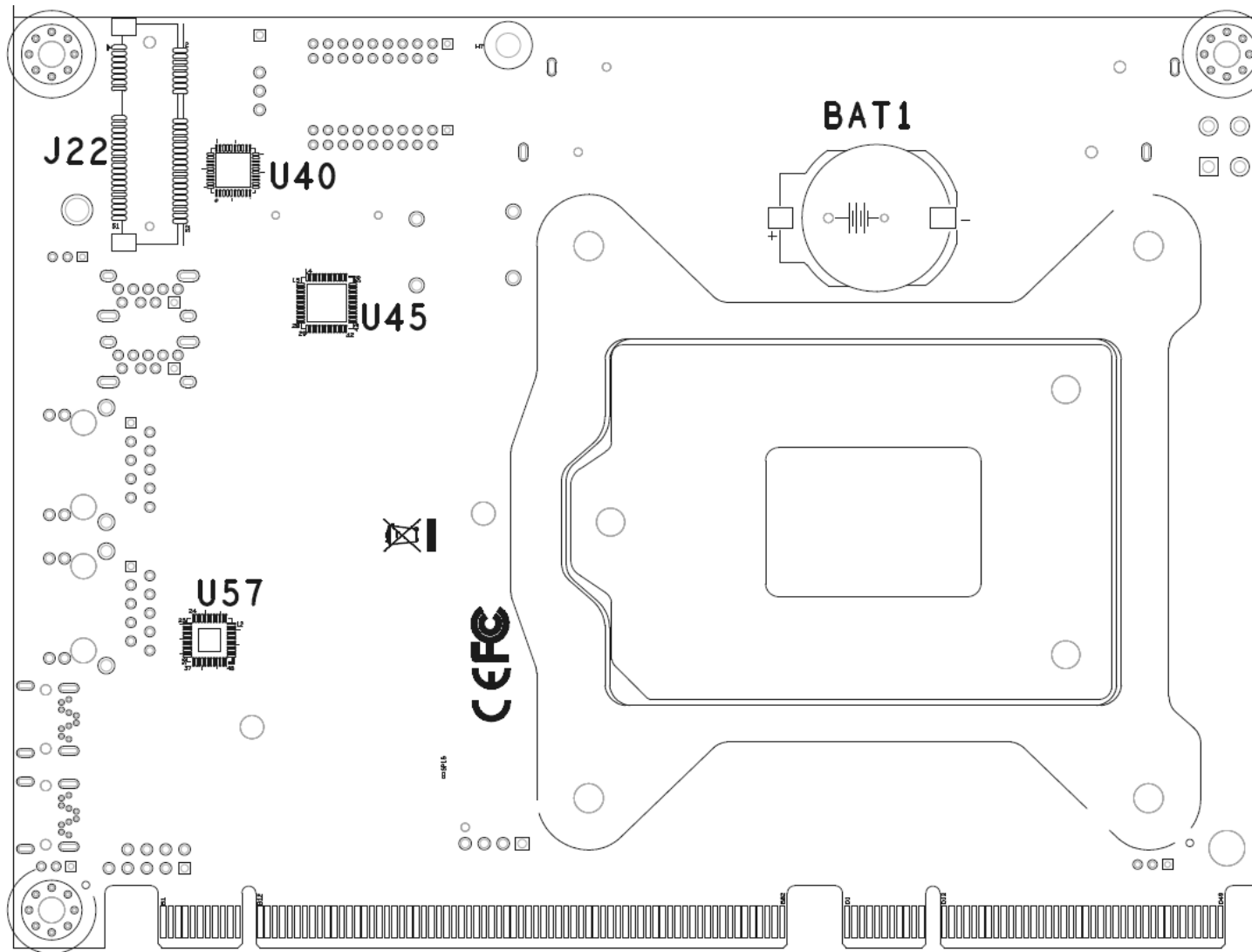


3 Hardware Configuration

3.1 Jumpers and Connectors

This chapter indicates jumpers', headers' and connectors' locations. Users may find useful information related to hardware settings in this chapter.





3.2 Jumpers Settings

For users to customize ROBO-6912VG2AR's features. In the following sections, Short means covering a jumper cap over jumper pins; Open or N/C (Not Connected) means removing a jumper cap from jumper pins. Users can refer to Figure 1 for the Jumper allocations.

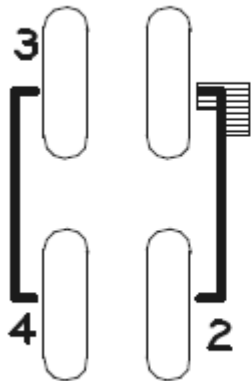
Jumper Table

The jumper settings are schematically depicted in this manual as follows:

Jump Function List:

Jumper	Function	Remark
JP4	IR35201 FW update/debug header(Reserve)	PH3Px1/2mm
JP1	LPC 80 Port Pin Header	Header5Px2/2.54mm
JP3	Configure PCIe x16, x8, x4	Header2Px2/2mm
JP5	Clear CMOS Setup	PH3Px1/2mm
JP2	ATX/AT Select Pin	PH3Px1/2mm

JP3: PCI Express* Bifurcation



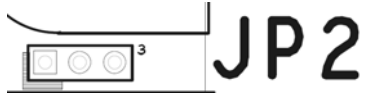
PIN No.	Description
1-2, Short 3-4, Short	1x8 , 2x4
1-2, Open 3-4, Short	Reserved
1-2, Short 3-4, Open	2x8
1-2, Open 3-4, Open	1x16

JP5: Clear CMOS Setup



PIN No.	Description
1-2, Short	Normal
2-3, Short	Clear CMOS

JP2: ATX/AT Select Pin



PIN No.	Description
1-2 Short	AT mode
1-2 Open	ATX mode

3.3 Connector Settings

Connector Allocation

I/O peripheral devices are connected to the interface connectors

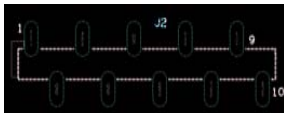
Connector Function List

Connector	Function	Remark
J2	Front Panel Pin Header	Header 10Px1/2.0mm
J1/J7	USB2.0/3.1 connector	
J10/J12	SATA Connector	
J9	DVI-I Connector	
J8	DDR4 Channel A Slot	
J3	DDR4 Channel B Slot	
J20	Audio Pin Header	Header 5Px2/2.54mm
J5	ATX 4 Pin Connector(For CPU Power)	
J13/J14	USB2.0/3.1(Gen2) connector(Type-A)	
J6	COM1 Pin Header	Header 5Px2/2 mm
J19	CPU Fan	
J16	RJ45 Connector for I219	
J15	RJ45 Connector for I210	

ROBO-6912VG2AR

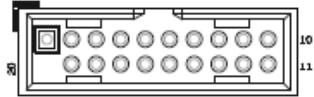
J27	SM Bus Pin Header	PH5Px1/2.54mm
J9	DVI-I Connector	
J22	mSATA connector	

J2: Front Panel Connector



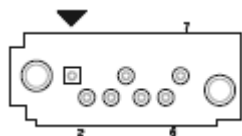
PIN No.	Description	PIN No.	Description
1	EXT_PWRBTN#	2	GND
3	RSTBTN#	4	GND
5	VCC	6	BUZZER
7	5VSB_FP	8	POWER-LED
9	VCC3_FP	10	SATA_LED#

J1/J7: USB2.0/3.1 connector

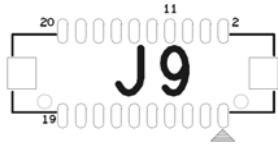


PIN No.	Description	PIN No.	Description
1	5VDual		
2	USB3_RX_N	19	5VDual
3	USB3_RX_P	18	USB3_RX_N
4	Ground	17	USB3_RX_P
5	USB3_TX_N	16	Ground
6	USB3_TX_P	15	USB3_TX_N
7	Ground	14	USB3_TX_P
8	USB2_N	13	Ground
9	USB2_P	12	USB2_N
10	Ground	11	USB2_P

J10/J12 : SATA Connector

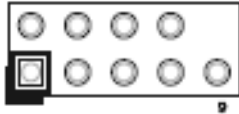


PIN No.	DESCRIPTION
1	Ground
2	TX_P
3	TX_N
4	Ground
5	RX_N
6	RX_P
7	Ground

J9: DVI Header

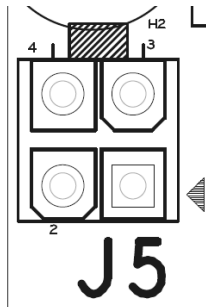
PIN No.	Description	PIN No.	Description
1	GND	2	GND
3	D_HDMI_D0_DP	4	D_HDMI_CLK_DP
5	D_HDMI_D0_DN	6	D_HDMI_CLK_DN
7	GND	8	GND
9	D_HDMI_D1_DP	10	DVI_POWER
11	D_HDMI_D1_DN	12	DVI_POWER
13	GND	14	D_HDMI_HPD_IN
15	D_HDMI_D2_DP	16	D_HDMI_DDC_CLK
17	D_HDMI_D2_DN	18	D_HDMI_DDC_DATA
19	GND	20	GND

J20: Audio Pin Header



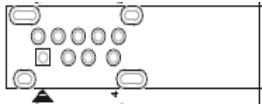
PIN No.	Description	PIN No.	Description
1	MIC_IN	2	Ground
3	LINE_IN_L	4	Ground
5	LINE_IN_R	6	Ground
7	AUDIO_OUT_L	8	Ground
9	AUDIO_OUT_R		

J5: ATX 4 Pin Connector(For CPU Power)



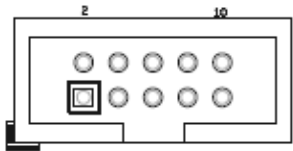
PIN No.	Description	PIN No.	Description
1	Ground	3	+12V
2	Ground	4	+12V

J13/J14 : USB2.0/USB3.1(Gen2) Connector



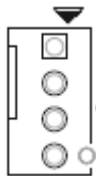
PIN No.	DESCRIPTION
1	5VDual
2	USB2_N
3	USB2_P
4	Ground
5	USB3_RX_N
6	USB3_RX_P
7	Ground
8	USB3_TX_N
9	USB3_TX_P

J6: COM1 Pin Header



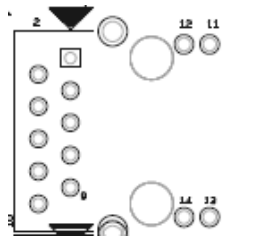
PIN No.	Description	PIN No.	Description
1	DCD#	2	RXD#
3	TXD#	4	DTR#
5	Ground	6	DSR#
7	RTS#	8	CTS#
9	RI#	10	NC

J19: CPU FAN



PIN No.	Description
1	Ground
2	12V
3	Fanin
4	Fanout

J15: RJ45 Connector for I210

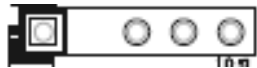


PIN No.	Description	PIN No.	Description
1	MDI0_P	2	MDI0_N
3	MDI1_P	4	MDI1_N
5	LAN_CT1	6	LAN_CT2
7	MDI2_P	8	MDI2_N
9	MDI3_P	10	MDI3_N
11	LED_100	12	LED_1000
13	LED_LINK#/ACT#	14	ACT_LED

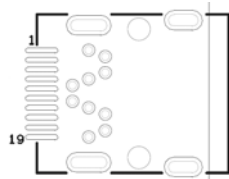
J16: RJ45 Connector for I219

PIN No.	Description	PIN No.	Description
1	MDI0_P	2	MDI0_N
3	MDI1_P	4	MDI1_N
5	LAN_CT1	6	LAN_CT2
7	MDI2_P	8	MDI2_N
9	MDI3_P	10	MDI3_N
11	LED_100	12	LED_1000
13	LED_LINK#/ACT#	14	ACT_LED

J4: SM Bus Pin Header



PIN No.	Description
1	Clock
2	NC
3	Ground
4	Data
5	VCC

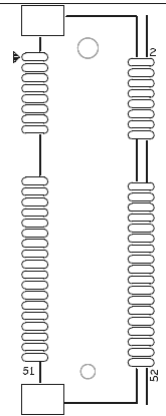
J18: MINI DP 1 Connector

PIN No.	Description	PIN No.	Description
1	GND	2	DP1_HPDP
3	DDIA_TX0_DP_R	4	OC_1_AUX_EN#
5	DDIA_TX0_DN_R	6	DP1_CFG2
7	GND	8	GND
9	DDIA_TX1_DP_R	10	DDIA_TX3_DP_R
11	DDIA_TX1_DN_R	12	DDIA_TX3_DN_R
13	GND	14	GND
15	DDIA_TX2_DP_R	16	DP1_AUXP
17	DDIA_TX2_DN_R	18	DP1_AUXN
19	GND	20	W40_VCC3_DP1

J17: MINI DP 2 Connector

PIN No.	Description	PIN No.	Description
1	GND	2	DP2_HPDP
3	DDIB_TX0_DP_R	4	OC_2_AUX_EN#
5	DDIB_TX0_DN_R	6	DP2_CFG2
7	GND	8	GND
9	DDIB_TX1_DP_R	10	DDIB_TX3_DP_R
11	DDIB_TX1_DN_R	12	DDIB_TX3_DN_R
13	GND	14	GND
15	DDIB_TX2_DP_R	16	DP2_AUXP
17	DDIB_TX2_DN_R	18	DP2_AUXN
19	GND	20	W40_VCC3_DP2

J22: mSATA connector



PIN No.	Description	PIN No.	Description
1	NC	2	VCC3
3	NC	4	GND
5	NC	6	MS_1P5S
7	NC	8	N/C
9	GND	10	NC
11	NC	12	NC
13	NC	14	NC
15	GND	16	NC

17	NC	18	GND
19	NC	20	N/C
21	GND	22	N/C
23	SATA_RX3_DP_C	24	VCC3
25	SATA_RX3_DN_C	26	GND
27	GND	28	MS_1P5S
29	GND	30	SMB_R1_CLK_MAIN
31	SATA_TX3_DN_C	32	SMB_R1_DATA_MAIN
33	SATA_TX3_DP_C	34	GND
35	GND	36	N/C
37	GND	38	NC
39	VCC3	40	GND
41	VCC3	42	N/C
43	DEV_SEL -	44	N/C
45	NC	46	N/C
47	NC	48	MS_1P5S
49	NC	50	GND
51	NC	52	VCC3

4 System Resources

4.1 Intel® Coffee Lake -S PCH

Intel® Q370/C246 Chipset (Intel® GL82Q370 PCH)

4.2 Main Memory

ROBO-6912VG2AR provides 2xDDR4 SO-DIMM sockets. The maximum memory can be up to 64GB. Memory clock and related settings can be detected by BIOS via SPD interface.

Watch out the contact and lock integrity of memory module with socket, it will impact on the system reliability. Follow normal procedures to install memory module into memory socket. Before locking, make sure that all modules have been fully inserted into the card slots.

4.3 Installing the Single Board Computer

To install your ROBO-6912VG2AR into standard chassis or proprietary environment, please perform the following:

Step 1 : Check all jumpers setting on proper position

Step 2 : Install and configure CPU,CPU cooling and memory module on right position

Step 3 : Place ROBO-6912VG2AR into the dedicated position in the system

Step 4 : Attach cables to existing peripheral devices and secure it

ROBO-6912VG2AR

WARNING

Please ensure that mother board is properly inserted and fixed by mechanism.

Note:

Please refer to section 6.3.1 to 6.3.4 to install INF/Graphic/LAN

4.3.1 Chipset Component Driver

ROBO-6912VG2AR is based on Intel® Q370 chipset and desktop processors including Core™ i7 / i5 / i3 sku . It's a new chipset that some old operating systems might not be able to recognize. To overcome this compatibility issue, for Windows Operating Systems such as Windows 8, please install its INF before any of other Drivers are installed. You can find very easily this chipset component driver in ROBO-6912VG2AR CD-title

4.3.2 Intel® UHD Graphics 630

ROBO-6912VG2AR has integrated Intel® UHD Graphics 630 which supports DirectX 12 、OpenGL 4.4. It is the most advanced design to gain an outstanding graphic performance. ROBO-6912VG2AR supports Mini-DP display output. This combination makes ROBO-6912VG2AR an excellent performance hardware.

Drivers Support

Please find the Graphic driver in the ROBO-6912VG2AR CD-title. The driver supports Windows 10.

4.3.3 Intel LAN I210AT/I219LM Gigabit Ethernet Controller

- Intel I210AT Gigabit Ethernet controller and 1x RJ45 connectors on rear I/O

ROBO-6912VG2AR

- Intel I219LM Gigabit Ethernet controller and 1x RJ45 connectors on rear I/O

Drivers Support

Please find Intel I210AT/I219LM LAN driver in /Ethernet directory of ROBO-6912VG2AR CD-title. The driver supports Windows 8.

5 BIOS Setup Items

5.1 Introduction

The following section describes the BIOS setup program. The BIOS setup program can be used to view and change the BIOS settings for the module. Only experienced users should change the default BIOS settings.

5.2 BIOS Setup

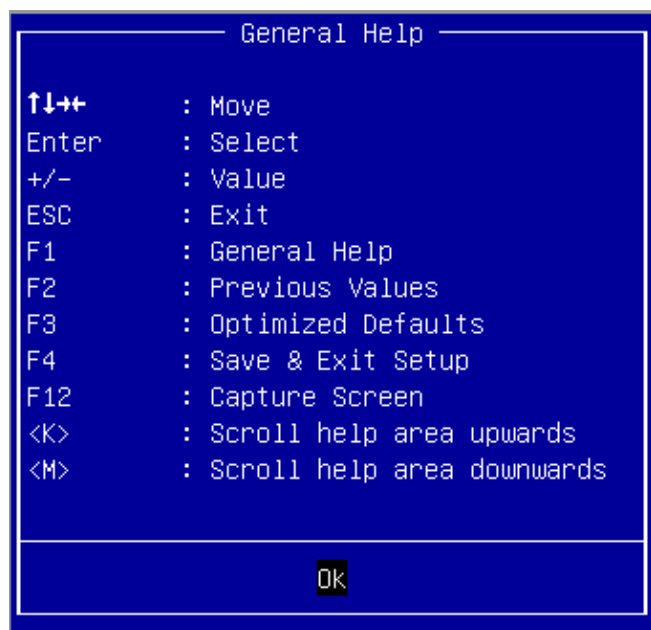
Power on the computer and the system will start POST (Power on Self Test) process. When the message below appears on the screen, press <Delete> or <ESC> key will enter BIOS setup screen.

Press <ESC > or <Delete> to enter SETUP

If the message disappears before responding and still wish to enter Setup, please restart the system by turning it OFF and On or pressing the RESET button. It can be also restarted by pressing <Ctrl>, <Alt>, and <Delete> keys on keyboard simultaneously.

Press <F1> to Run General Help or Resume

The BIOS setup program provides a General Help screen. The menu can be easily called up from any menu by pressing <F1>. The Help screen lists all the possible keys to use and the selections for the highlighted item. Press <Esc> to exit the Help Screen.



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5.2.1 Main

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

```
Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
Main Configuration Security Boot Save & Exit

Project Name                      ROBO_6912VG2AR
BIOS Version & Build Date         0.1.0 (03/17/2020 17:04:45)
EC Version & Build Date           R00.E07 (12/17/2019)
Access Level                      Administrator

Processor Information
Name                             CoffeeLake DT
Type                             Intel(R) Core(TM) i5-8500T CPU @ 2.10GHz
Speed                             2100 MHz
ID                               0x906EA
Stepping                         U0
Package                          LGA1151
Number of Processors              6Core(s) / 6Thread(s)
Microcode Revision                CC
GT Info                           GT2 (0x3E92)

IGFX VBIOS Version                N/A
IGFX GOP Version                  9.0.1091
Memory RC Version                 0.7.1.108
Total Memory                      4096 MB
Memory Frequency                  2133 MHz
Memory Timings (tCL-tRCD-tRP-tRAS) 15-15-15-36

Channel 0 Slot 0                  Not Populated / Disabled
Channel 1 Slot 0                  Populated & Enabled
Size                              4096 MB (DDR4)
```

ROBO-6912VG2AR

```

PCH Information
Name                CNL PCH-H
PCH SKU             C246
Stepping            B0
ChipsetInit Base Revision 10
ChipsetInit OEM Revision 22
Package             Not Implemented Yet
TXT Capability of Platform/PCH Supported
Production Type     Production

Dual Output Fast Read support Not supported
Read ID/Status Clock Freq  48 MHz
Write and Erase Clock Freq 48 MHz
Fast Read Clock Freq       48 MHz
Fast Read support          Supported
Read Clock Freq            30 MHz
Number of Components       1 Component
SPI Component 0 Density     16 MB

ME FW Version          12.0.64.1551
ME Firmware SKU        Corporate SKU

System Date            [Thu 01/01/2009]
System Time            [17:51:17]
  
```

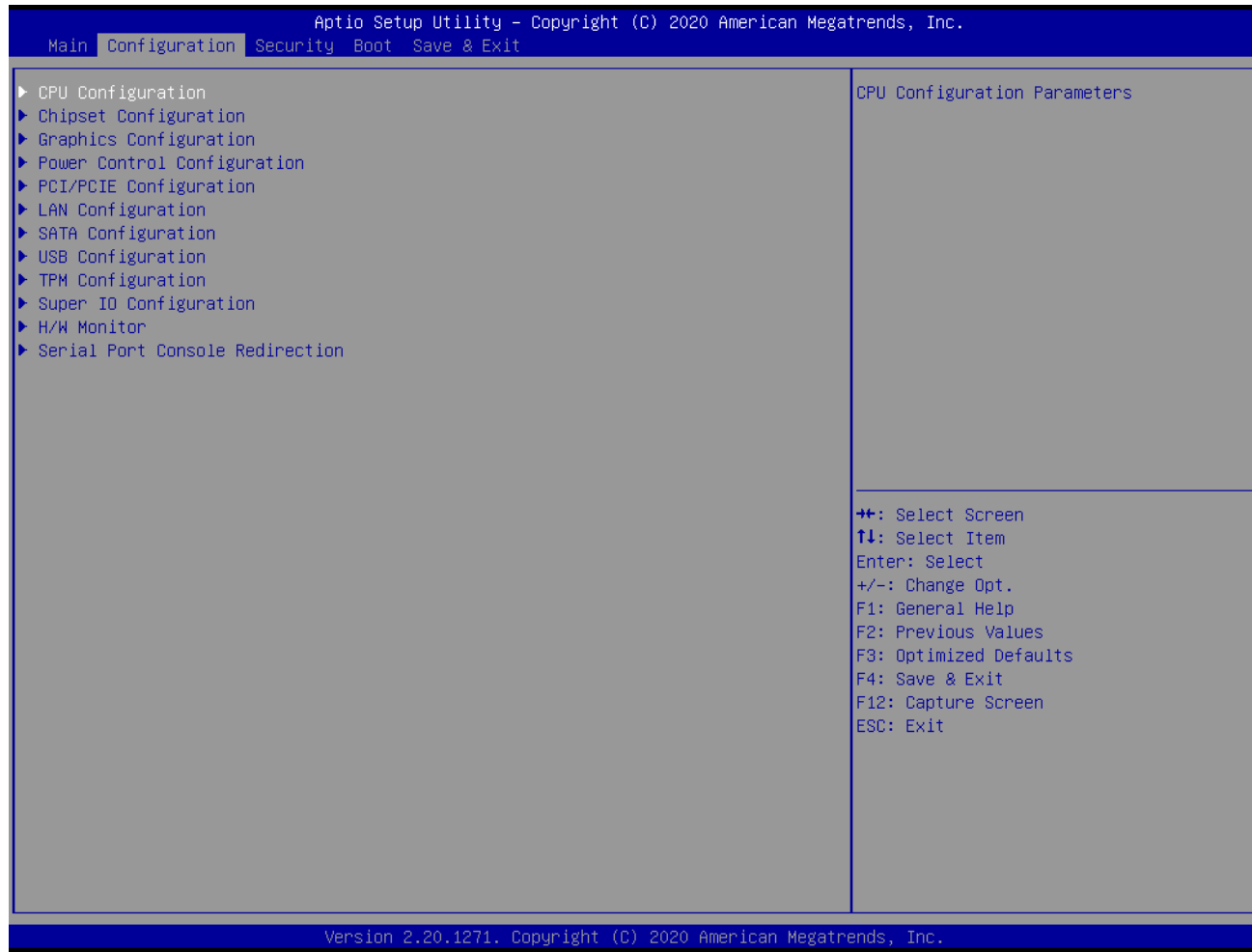
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Feature	Description	Options
System Date	The date format is <Day>, <Month> <Date> <Year>. Use [+] or [-] to configure system Date.	
System Time	The time format is <Hour> <Minute> <Second>. Use [+] or [-] to configure system Time.	

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5.2.2 Configuration

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



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CPU Configuration

CPU Configuration Parameters

Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.		
Configuration		
CPU Configuration		Enable/Disable CPU Flex Ratio Programming
Type	Intel(R) Core(TM) i5-8500T CPU @ 2.1...	
ID	0x906EA	
Speed	2100 MHz	
L1 Data Cache	32 KB x 6	
L1 Instruction Cache	32 KB x 6	
L2 Cache	256 KB x 6	
L3 Cache	9 MB	
L4 Cache	N/A	
VMX	Supported	
SMX/TXT	Supported	
CPU Flex Ratio Override	[Enabled]	
CPU Flex Ratio Settings	20	
Active Processor Cores	[All]	
Boot performance mode	[Max Non-Turbo Performance]	
Intel (VMX) Virtualization Technology	[Enabled]	
Intel(R) SpeedStep(tm)	[Enabled]	←+: Select Screen
Intel(R) Speed Shift Technology	[Enabled]	↑↓: Select Item
Turbo Mode	[Enabled]	Enter: Select
C states	[Enabled]	+/-: Change Opt.
Enhanced C-states	[Enabled]	F1: General Help
C-State Auto Demotion	[C1 and C3]	F2: Previous Values
C-State Un-demotion	[C1 and C3]	F3: Optimized Defaults
Package C-State Demotion	[Disabled]	F4: Save & Exit
Package C-State Un-demotion	[Disabled]	F12: Capture Screen
CState Pre-Wake	[Enabled]	ESC: Exit
IO MWAIT Redirection	[Disabled]	
Package C State Limit	[Auto]	

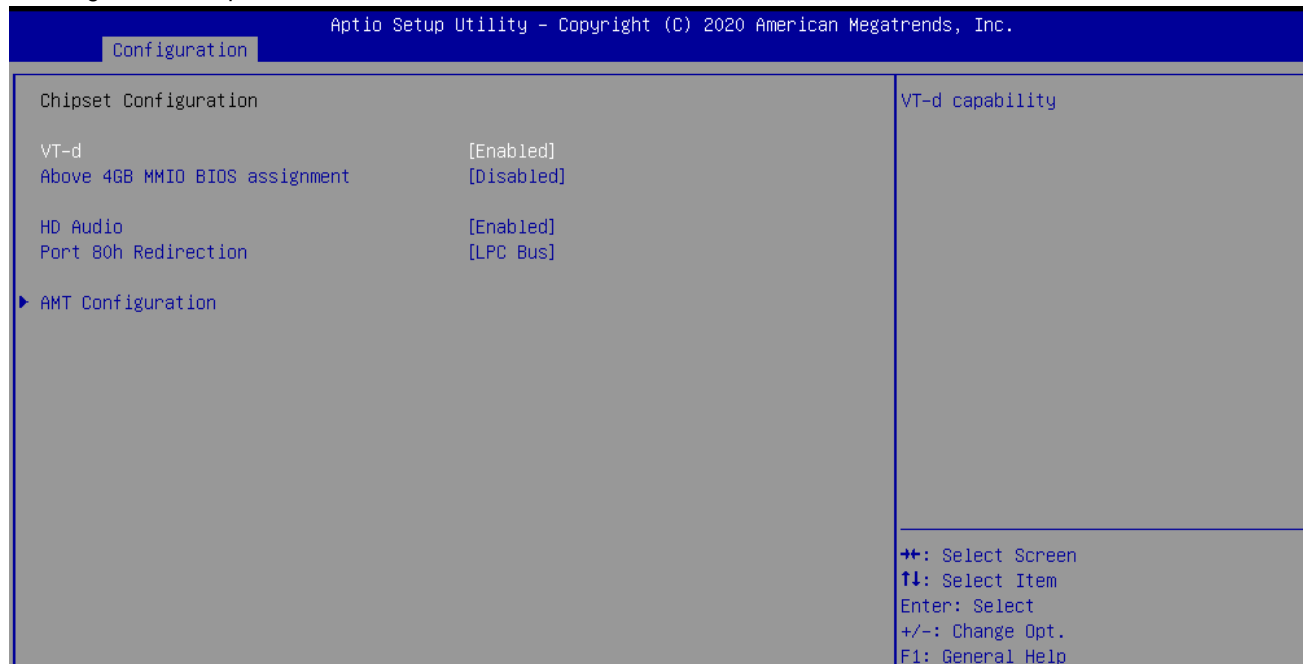
Feature	Description	Options
CPU Flex Ratio Override	Enable/Disable CPU Flex Ratio Programming	★ Disabled, Enabled
CPU Flex Ratio Override[Enabled]		
CPU Flex Ratio Settings	This value must be between Max Efficiency Ratio (LFM) and Maximum non-turbo ratio set by Hardware (HFM).	★ 21
Active Processor Cores	Number of cores to enable in each processor package.	★ All, 1, 2, 3,4,5
Boot performance mode	Select the performance state that the BIOS will set starting from reset vector	★ Max Non-Turbo Performance, Turbo Performance, Max Battery
Intel (VMX) Virtualization Technology	When enabled, a VMM can utilize the additional hardware capabilities provided by Vander pool Technology.	★ Enabled, Disabled
Intel® Speed Step™	Allows more than two frequency ranges to be supported.	★ Enabled, Disabled
Intel® Speed Shift Technology	Enable/Disable Intel® Speed Shift Technology support. Enabling will expose the CPPC v2 interface to allow for hardware controlled P-states	★ Enabled, Disabled
Turbo Mode	Enable/Disable processor Turbo Mode (requires Intel Speed Step or Intel Speed Shift to be available and enabled)	★ Enabled, Disabled
C states	Enable/disable CPU Power Management. Allows CPU to go to C states It's not 100% utilized	★ Enabled, Disabled
Enhanced C-states	Enable/Disable C1E. When enabled, CPU will switch to minimum speed when all cores enter C-state	★ Enabled, Disabled
C-State Auto Demotion	Configure C-State Auto Demotion	★ C1 and C3, Disable, C1 ,C3
C-State Un-demotion	Configure C-State Un-demotion	★ C1 and C3, Disable, C1 ,C3
Package C State Demotion	Package C-State Demotion	★ Disabled, Enabled
Package C State Un-demotion	Package C-State Un-demotion	★ Disabled, Enabled
CState Pre-Wake	Disable – Sets bit 30 of POWER_CTL MSR(0x1FC) to 1 to disable the Cstate Pre-Wake	★ Enabled ,Disabled

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IO MWAIT Redirection	When set, will map IO_read instructions sent to IO registers PMG_IO_BASE_ADDRBASE+offset to MWAIT(offset)	★ Disabled, Enabled
Package C State Limit	Maximum Package C State Limit Setting. Cpu Default: Leaves to Factory default value. Auto: Initializes to deepest available Package C States Limit	★ Auto,C0/C1,C2,C3,C6,C7,C7S,C8,C9,C10,Cpu Default,

ipset Configuration

Configuration Chipset feature

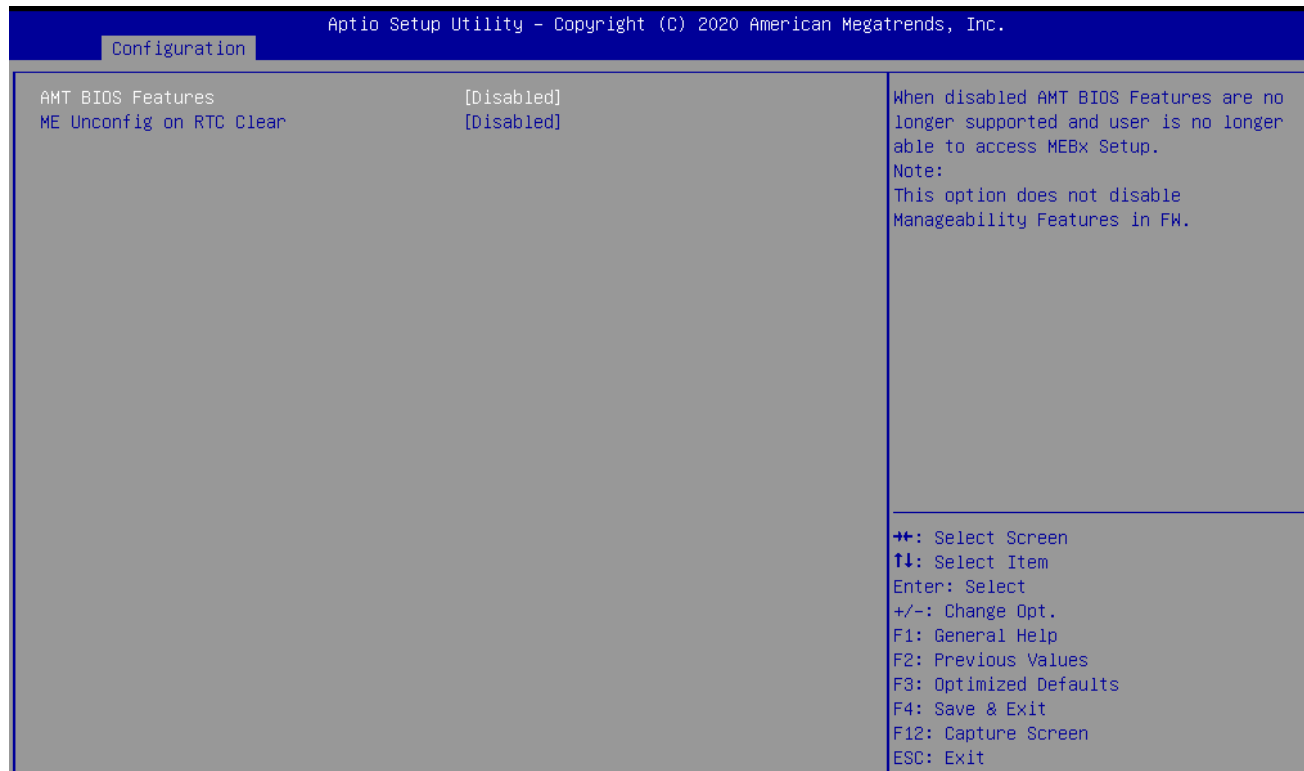


Feature	Description	Options
VT-d	VT-d Capability	★Enabled ,Disabled
Above 4GB MMIO BIOS assignment	Enable/Disable above 4GB MemoryMappedIO BIOS assignment This is enabled automatically when Aperture Size is set to 2048MB	★Disabled, Enabled
HD Audio	Control Detection of the HD-Audio device. Disabled= HAD will be unconditionally disabled Enabled= HAD will be unconditionally enabled.	★Enabled ,Disabled
Port 80h Redirection	Control where the Port 80h cycles are sent	★LPC Bus, PCIE Bus

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AMT Configuration

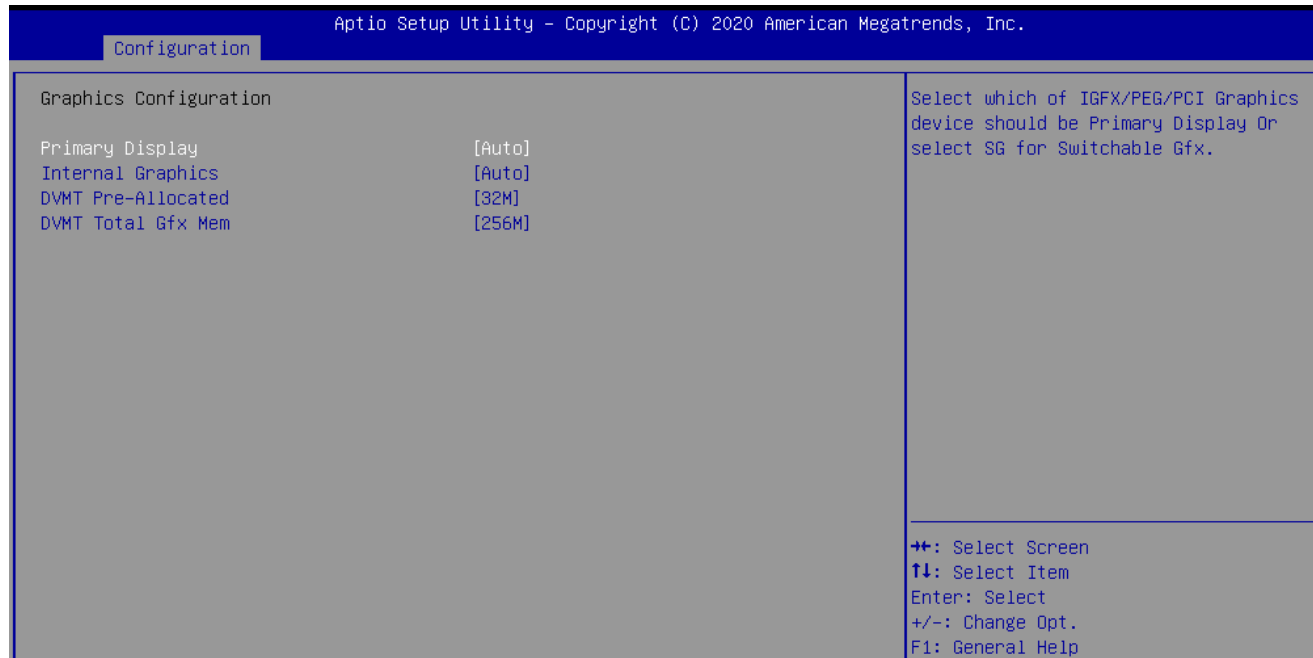
Configure Intel® Active Management Technology Parameters



Feature	Description	Options
AMT BIOS Features	When disable AMT BIOS Features are no longer supported and user is no longer able to access MEBx Setup. Note: This option does not disable Manageability Features in FW	★Disabled, Enabled
ME Unconfig on RTC Clear	When Disable ME will not be unconfigured on RTC Clear	★Disabled, Enabled

Graphics Configuration

Configuration Graphics Settings

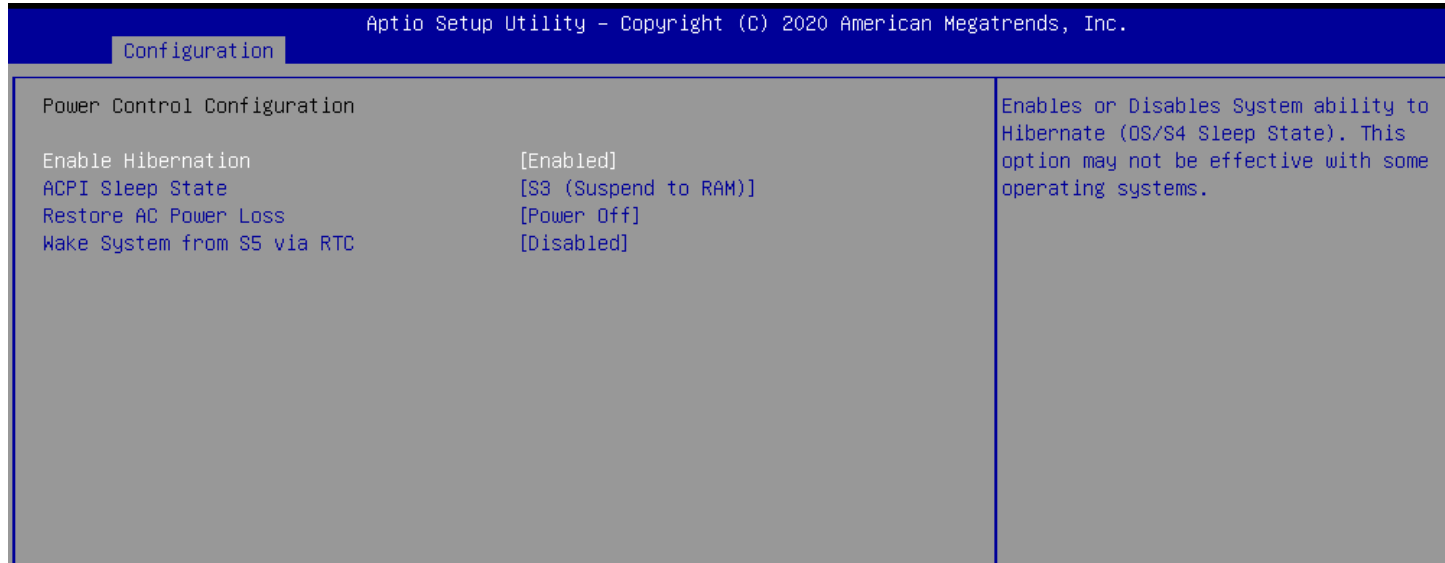


Feature	Description	Options
Primary Display	Select which of IGFX/PEG/PCI Graphics device should be Primary Display Or select SG for Switchable Gfx.	★Auto, IGFX, PEG, PCIE
Internal Graphics	Keep IGFX enable based on the setup options.	★Auto, Disable, Enable
DVMT Pre-Allocated	Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.	★32M,0M,64M,4M,8M,12M,16M,20M,24M,28M,32M/F7,36M,40M,44M,48M,52M,56M, 60M
DVMT Total Gfx Mem	Select DVMT5.0 Total Graphic Memory size used by the Internal Graphics Device	★256M, 128M, MAX

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Power Control Configuration

System Power Control Configuration Parameters



Feature	Description	Options
Enable Hibernation	Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS.	★Enabled, Disabled
ACPI Sleep State	Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed.	★S3 (Suspend to RAM) ,Suspend Disabled
Restore AC Power Loss	Specify what state to go to when power is re-applied after a power failure (G3 state)	★Power Off ,Power On ,Last State
Wake System from S5 via RTC	Enable or disable System wake on alarm event. When enabled, System will wake on the hr::min::sec Specified/programmed by the Tools from OS	★Disabled, Enabled

ROBO-6912VG2AR

PCI/PCIE Configuration

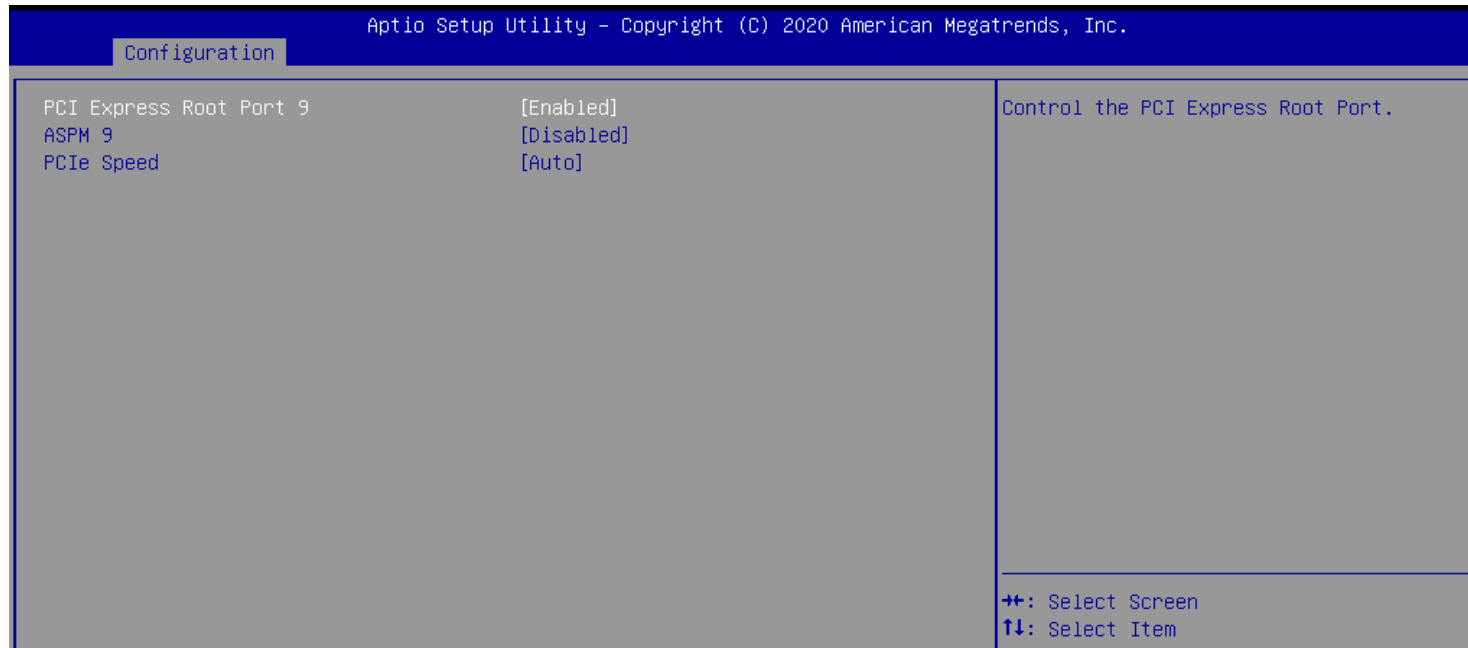
PCI, PCI-X and PCI Express Settings



Feature	Description	Options
PEG Port Lane Width	Set PEG port Lane width	★1x16, 2x8,1x8. 2x4

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PCI Express Root Port9



Feature	Description	Options
PCI Express Root Port 9	Control the PCI Express Root Port.	★Enabled , Disabled
ASPM 9	Set the ASPM Level: Force L0s – Force all links to L0s State AUTO-BIOS auto configure DISABLE – Disables ASPM	★Disabled, L0s, L1, L0sL1, Auto
PCIe Speed	Select PCI Express port speed	★Auto, Gen1, Gen2, Gen3

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LAN Configuration

Configuration On Board LAN device.

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Configuration

LAN Configuration		Enable/Disable onboard NIC.
Intel Ethernet Controller WGI219LM		
LAN MAC Address	00-90-FB-6D-DB-C0	
PCH LAN Controller	[Enabled]	
Wake on LAN Enable	[Enabled]	
Intel Ethernet Controller WGI210AT		
LAN MAC Address	00-90-FB-6D-DB-C1	
Intel LAN I210 Controller	[Enabled]	
Wake on LAN Enable	[Enabled]	
Launch UEFI PXE ROM	[Enabled]	
Ipv4 PXE Support	[Enabled]	
Ipv4 HTTP Support	[Enabled]	
Ipv6 PXE Support	[Enabled]	
Ipv6 HTTP Support	[Enabled]	
IPSEC Certificate	[Enabled]	
PXE boot wait time	0	
Media detect count	1	

++: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
F12: Capture Screen
ESC: Exit

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Feature	Description	Options
PCH LAN Controller	Enable/Disable onboard NIC	★ Enabled , Disabled
Wake on LAN Enable	Enable/Disable integrated LAN to wake the system.	★ Enabled , Disabled
Intel LAN I210 Controller	Enable or Disable the Intel LAN I210 Controller#1	★ Enabled , Disabled
Wake on LAN Enable	Enable/Disable integrated LAN to wake the system.	★ Enabled , Disabled
Launch UEFI PXE ROM	Enable/Disable UEFI Network Stack	★ Disabled, Enabled
Launch UEFI PXE ROM[Enable]		
Ipv4 PXE Support	Enable/Disable Ipv4 PXE boot support. If disable, IPv4 PXE boot support will not be available.	★ Enabled, Disabled
Ipv4 HTTP Support	Enable/Disable Ipv4 HTTP boot support. If disable, IPv4 HTTP boot support will not be available.	★ Enabled, Disabled
Ipv6 PXE Support	Enable/Disable Ipv6 PXE boot support. If disable, IPv6 PXE boot support will not be available.	★ Enabled, Disabled
Ipv6 HTTP Support	Enable/Disable Ipv6 HTTP boot support. If disable, IPv6 HTTP boot support will not be available.	★ Enabled, Disabled
IPSEC Certificate	Support to Enable/Disable IPSEC certificate for Ikev	★ Enabled, Disabled
PXE boot wait time	Wait time in seconds to press ESC key to abort the PXE boot. Use either +/- or numeric keys to set the values	★ 0
Media detect count	Number of times the presence of media will be checked. Use either +/- or numeric keys to set the values.	★ 1

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SATA Configuration

SATA Device Options Settings

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Configuration

SATA Configuration		Enable/Disable SATA Device.
SATA Controller(s)	[Enabled]	
SATA Mode Selection	[AHCI]	
SATA Controller Speed	[Default]	
Serial ATA Port 0	Empty	
Software Preserve	Unknown	
Port 0	[Enabled]	
Hot Plug	[Disabled]	
Configured as eSATA	Hot Plug supported	
SATA Device Type	[Hard Disk Drive]	
Serial ATA Port 1	Empty	
Software Preserve	Unknown	
Port 1	[Enabled]	
Hot Plug	[Disabled]	
Configured as eSATA	Hot Plug supported	
SATA Device Type	[Hard Disk Drive]	
Serial ATA Port 3	Empty	
Software Preserve	Unknown	
Port 3	[Enabled]	
Hot Plug	[Disabled]	
Configured as eSATA	Hot Plug supported	
SATA Device Type	[Hard Disk Drive]	

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++: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
F12: Capture Screen
ESC: Exit

ROBO-6912VG2AR

Feature	Description	Options
SATA Controller(s)	Enable/disable the SATA controllers.	★ Enabled , Disabled
SATA Mode Selection	Determines how SATA controller(s) operate.	★ AHCI, Intel RST Premium With Intel Optane System Acceleration
SATA Controller Speed	Indicates the maximum speed the SATA controller can support	★ Default, Gen1, Gen2, Gen3
Serial ATA Port 0/1/3		
Port 0/1/3	Enable or Disable SATA Port	★ Enabled , Disabled
Hot Plug	Designates this port as Hot Pluggable	★ Disabled, Enabled
SATA Device Type	Identify the SATA port is connected to Solid State Drive or Hard Disk Drive	★ Hard Disk Drive, Solid State Drive

USB Configuration

USB Configuration Parameters

Configuration		Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.	
USB Configuration		Enable/Disable this USB Physical Connector (physical port). Once disabled, any USB devices plug into the connector will not be detected by BIOS or OS.	
USB Controllers:			
1 XHCI			
USB Devices:			
1 Drive, 1 Keyboard			
USB SS Physical Connector #0	[Enabled]		
USB SS Physical Connector #1	[Enabled]		
USB SS Physical Connector #2	[Enabled]		
USB SS Physical Connector #3	[Enabled]		
USB SS Physical Connector #4	[Enabled]		
USB SS Physical Connector #5	[Enabled]		
USB HS Physical Connector #0	[Enabled]		
USB HS Physical Connector #1	[Enabled]		
USB HS Physical Connector #2	[Enabled]		
USB HS Physical Connector #3	[Enabled]		
USB HS Physical Connector #4	[Enabled]		
USB HS Physical Connector #5	[Enabled]		
Legacy USB Support	[Enabled]	++: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit F12: Capture Screen ESC: Exit	
XHCI Hand-off	[Enabled]		
USB Mass Storage Driver Support	[Enabled]		
Mass Storage Devices:			
UFD 3.0 Silicon-Power16GPMAP	[Auto]		

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ROBO-6912VG2AR

Feature	Description	Options
USB SS/HS Physical Connector #0~5	Enable/Disable this USB Physical Connector (physical port). Once disable, any USB devices plug into the connector will not be detected by BIOS or OS	★Enabled , Disabled
Legacy USB Support	Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications.	★Enabled , Disabled, Auto
XHCI Hand-off	This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver	★Enabled , Disabled
USB Mass Storage Driver Support	Enable/Disable USB Mass Storage Driver Support	★Enabled , Disabled

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TPM Configuration

Trusted Computing Setting

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Configuration		
TPM20 Device Found		Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.
Firmware Version:	5.63	
Vendor:	IFX	
Security Device Support	[Enable]	
Active PCR banks	SHA-1,SHA256	<hr/>
Available PCR banks	SHA-1,SHA256	
SHA-1 PCR Bank	[Enabled]	
SHA256 PCR Bank	[Enabled]	
Pending operation	[None]	
Platform Hierarchy	[Enabled]	
Storage Hierarchy	[Enabled]	
Endorsement Hierarchy	[Enabled]	
TPM2.0 UEFI Spec Version	[TCG_2]	
Physical Presence Spec Version	[1.3]	
TPM 20 InterfaceType	[TIS]	↔+: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit F12: Capture Screen ESC: Exit
Device Select	[Auto]	

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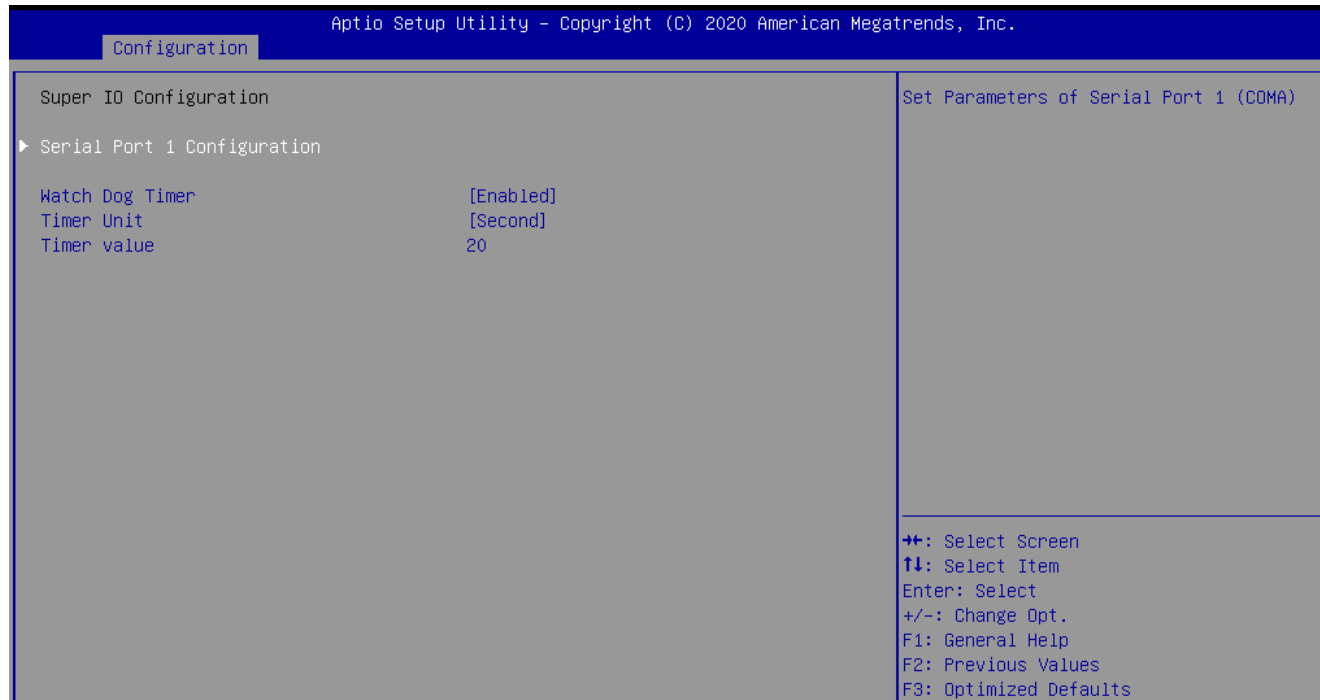
ROBO-6912VG2AR

Feature	Description	Options
Security Device Support	Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A Interface will not be available.	★Enabled , Disabled
SHA-1 PCR Bank	Enables or Disables SHA-1 PCR Bank	★Enabled , Disabled
SHA256 PCR Bank	Enables or Disables SHA256 PCR Bank	★Enabled , Disabled
Pending operation	Schedule an Operation for the Security Device. Note: Your Computer will reboot during restart in order to change State of Security Device	★None, TPM Clear
Platform Hierarchy	Enables or Disables Platform Hierarchy	★Enabled , Disabled
Storage Hierarchy	Enables or Disables Storage Hierarchy	★Enabled , Disabled
Endorsement Hierarchy	Enables or Disables Endorsement Hierarchy	★Enabled , Disabled
TPM2.0 UEFI Spec Version	Select the TCG2 Spec Version Support TCG_1_2: the Compatible mode for Win8/Win10 TCG_2: Support new TCG2 protocol and event format for Win10 or later	★TCG_2 ,TCG_1_2
Physical Presence Spec Version	Select to Tell O.S. to Support PPI Spec Version 1.2 or 1.3. Note some HCK tests might not support 1.3	★1.3,1.2
Device Select	TPM 1.2 will restrict support to TPM 1.2 devices, TPM 2.0 will restrict support to TPM 2.0 devices, Auto will support both with the default set to TPM 2.0 devices if not found, TPM 1.2 devices will be enumerated.	★Auto, TPM 1.2, TPM 2.0

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Super IO Configuration

System Super IO Chip Parameters.



Feature	Description	Options
Serial Port 1 Configuration	Set Parameters of Serial Port1(COMA)	
Watch Dog Timer	Enable/Disable Watch Dog Timer	★ Disabled, Enabled
Watch Dog Timer[Enable]		
Timer Unit	Select Timer count unit of WDT	★ Second, Minute
Timer value	Set WDT Timer value seconds/minutes	★ 20

ROBO-6912VG2AR

Serial Port 1 Configuration

Set Parameters of Serial Port 1 (COM A)

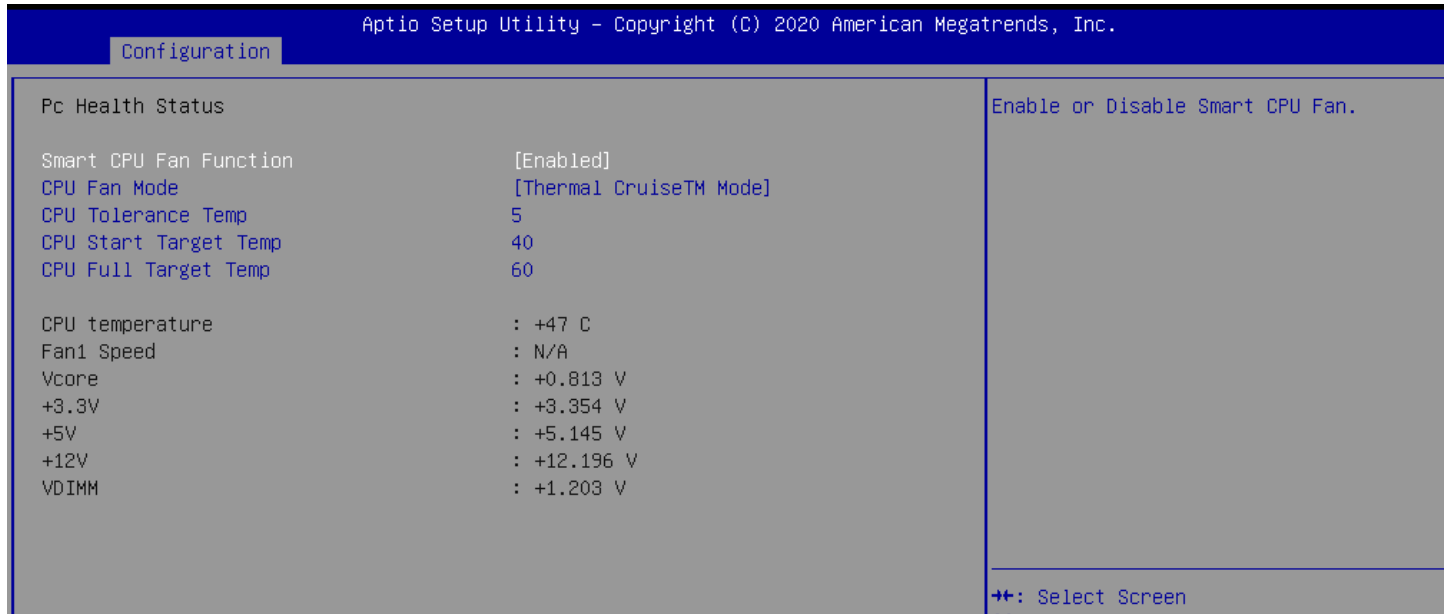
The screenshot shows the Aptio Setup Utility interface. At the top, a blue header bar contains the text 'Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.' and a 'Main' button. Below the header, the 'Serial Port 1 Configuration' screen is displayed. It is divided into two main sections. The left section, titled 'Serial Port 1 Configuration', contains the following settings: 'Module Serial Port 1' set to '[Enabled]', 'Device Settings' set to 'IO=3F8h; IRQ=4;', 'RS-232/422/485 Control Option' set to '[RS-232]', and 'Change Settings' set to '[Auto]'. The right section, titled 'Enable or Disable Serial Port (COM)', is currently empty.

Feature	Description	Options
Module Serial Port 1	Enable or Disable Serial Port (COM)	★Enabled, Disabled
RS-232/422/485 Control Option		★RS-232, RS-485 HALF DUPLEX, RS-422 FULL DUPLEX
Change Settings	Select an optimal settings for Super IO Device	★Auto ,IO=3F8h; IRQ=4, IO=3F8h; IRQ=3,4,5,6,7,9,10,11,12 IO=2F8h; IRQ=3,4,5,6,7,9,10,11,12 IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12 IO=2E8h; IRQ=3,4,5,6,7,9,10,11,12

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H/W Monitor

Monitor hardware status

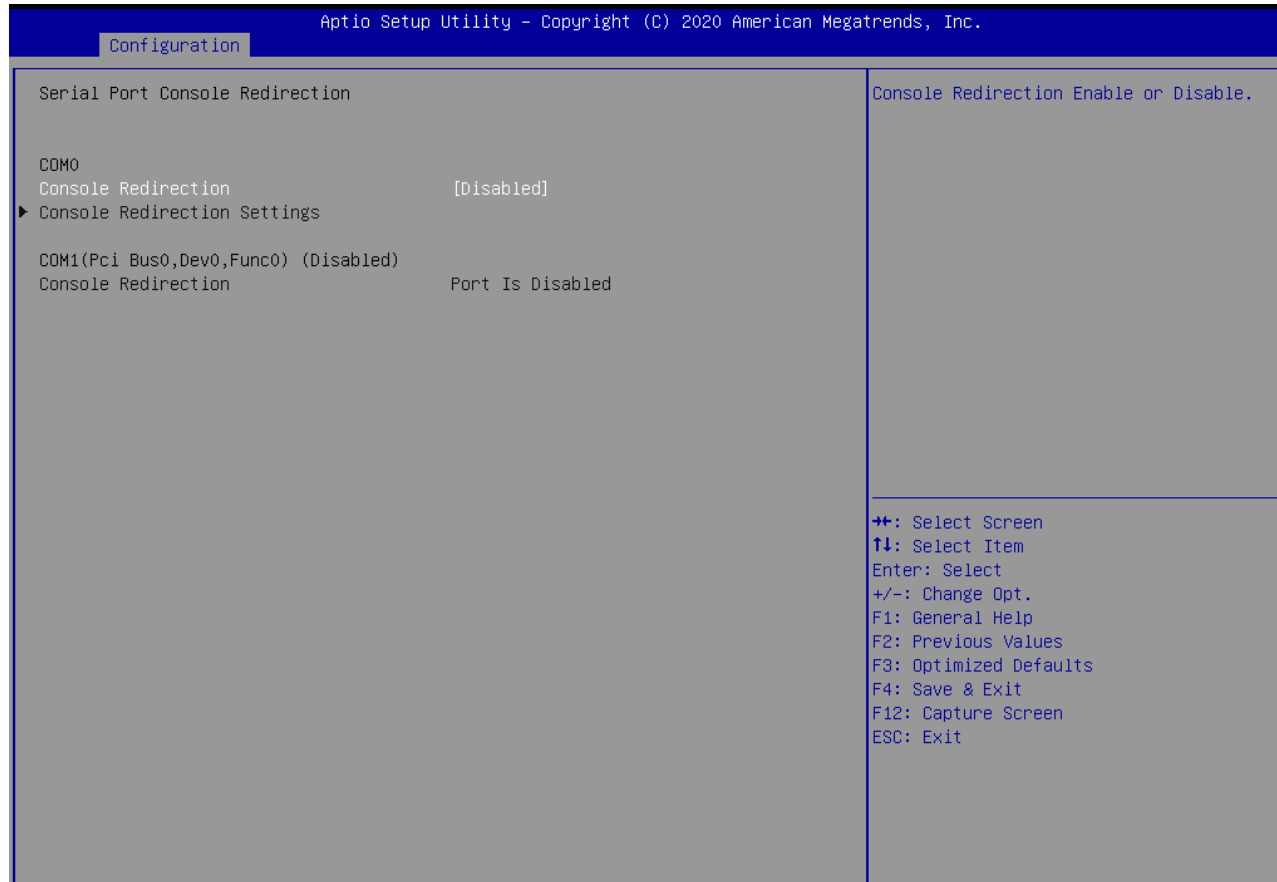


Feature	Description	Options
Smart CPU Fan Function	Enable or Disable Smart CPU Fan.	★Disabled ,Enabled
Smart CPU Fan Function[Enable]		
CPU Fan Mode	Thermal Cruise™ Mode: The Fan was cruise controlled by temperature.	★Thermal Cruise™ Mode
CPU Tolerance Temp	CPU Fan Tolerance Temperature	★5
CPU Start Target Temp	CPU Start Fan Target Temperature	★40
CPU Full Target Temp	CPU Full Fan Target Temperature	★60

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Serial Port Console Redirection

Serial Port Console Redirection



Feature	Description	Options
Console Redirection	Console Redirection Enable or Disable	★Disabled, Enabled

ROBO-6912VG2AR

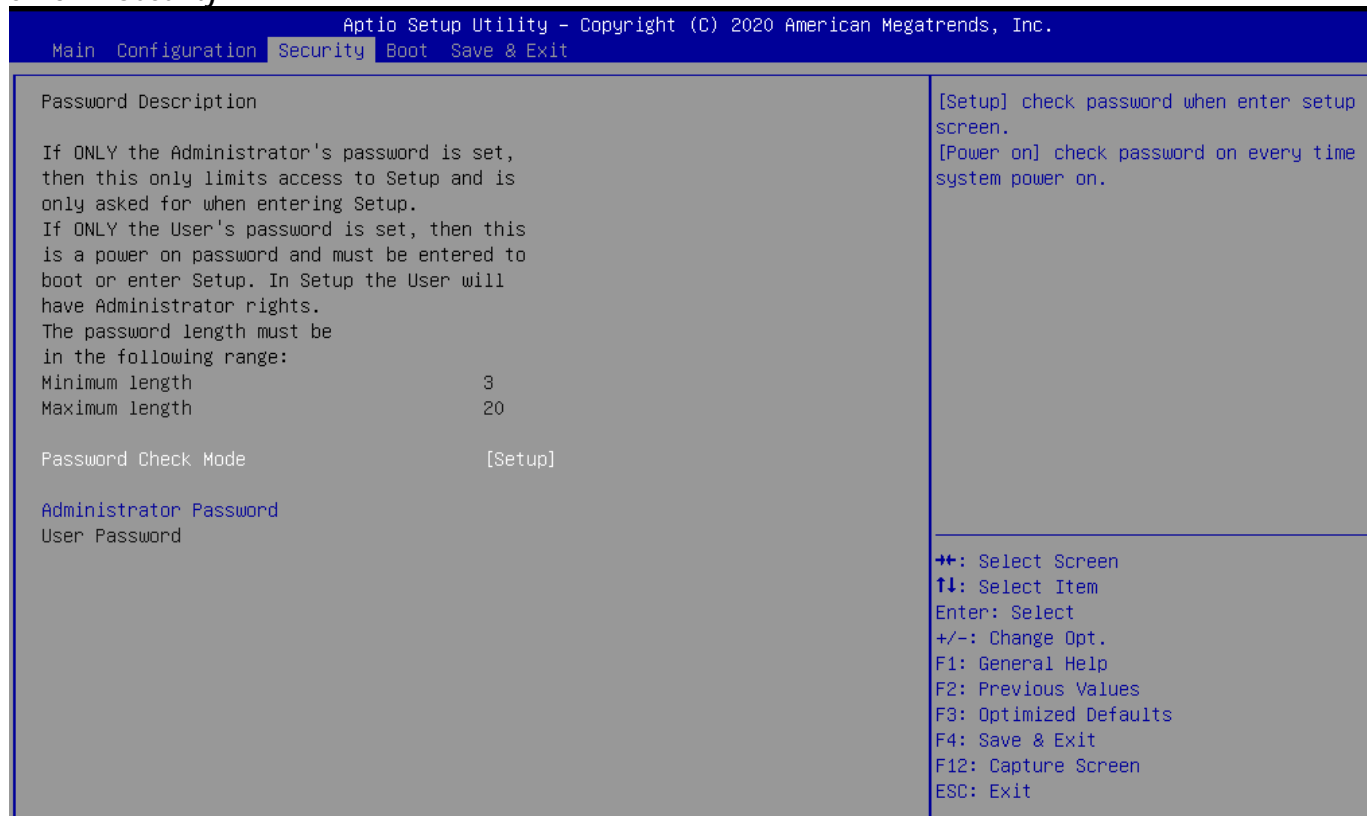
Console Redirection Settings

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Configuration		
COM0 Console Redirection Settings		Emulation: ANSI: Extended ASCII char set. VT100: ASCII char set. VT100+: Extends VT100 to support color, function keys, etc. VT-UTF8: Uses UTF8 encoding to map Unicode chars onto 1 or more bytes.
Terminal Type	[ANSI]	
Bits per second	[115200]	
Data Bits	[8]	
Parity	[None]	
Stop Bits	[1]	
Flow Control	[None]	
VT-UTF8 Combo Key Support	[Enabled]	
Recorder Mode	[Disabled]	
Resolution 100x31	[Disabled]	
Putty KeyPad	[VT100]	
		++: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit F12: Capture Screen ESC: Exit
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Feature	Description	Options
Terminal Type	Emulation: ANSI: Extended ASCII char set. VT100: ASCII char set. VT100+: Extends VT100 to support color , function keys, etc. VT-UTF8: Uses UTF8 encoding to map Unicode chars onto 1 or more bytes.	★ANSI, VT100, VT100+, VT-UTF8
Bits per second	Select Serial port transmission speed. The speed must be matched on other side. Long or noisy lines may require lower speeds.	★115200, 9600, 19200, 38400, 57600
Data bits	Data bits	★8, 7
Parity	A parity bit can be sent with the data bits to detect some transmission errors. Even: parity bit is 0 if the num of 1's in the data bits is even. Odd: parity bit is 0 if num of 1's in the data bits is odd. Mark: parity bit is always 1. Space parity bit is always 0. Mark and Space Parity do not allow for error detection. They can be used as an additional data bit.	★None, Even, Odd, Mark, Space
Stop Bits	Stop bits indicate the end of a serial data packet. (A start bit indicates the beginning). The standard setting is 1 stop bit. Communication with slow devices may require more than 1 stop bit.	★1,2
Flow Control	Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a 'stop' signal can be sent to stop the data flow. Once the buffers are empty, a 'start' signal can be sent to re-start the flow. Hardware flow control uses two wires to send start/stop signals.	★None, Hardware RTS/CTS
VT-UTFB Combo Key Support	Enable VT-UTF8 Combination Key Support for ANSI/VT100 terminals	★Enabled, Disabled
Recorder Mode	With this mode enabled only text will be sent. This is to capture Terminal data.	★Disabled, Enabled
Resolution 100x31	Enables or disables extended terminal resolution	★Disabled, Enabled
Putty KeyPad	Select FunctionKey and KeyPad on Putty	★VT100, LINUX,XTERMR6, SCO,ESCN,VT400

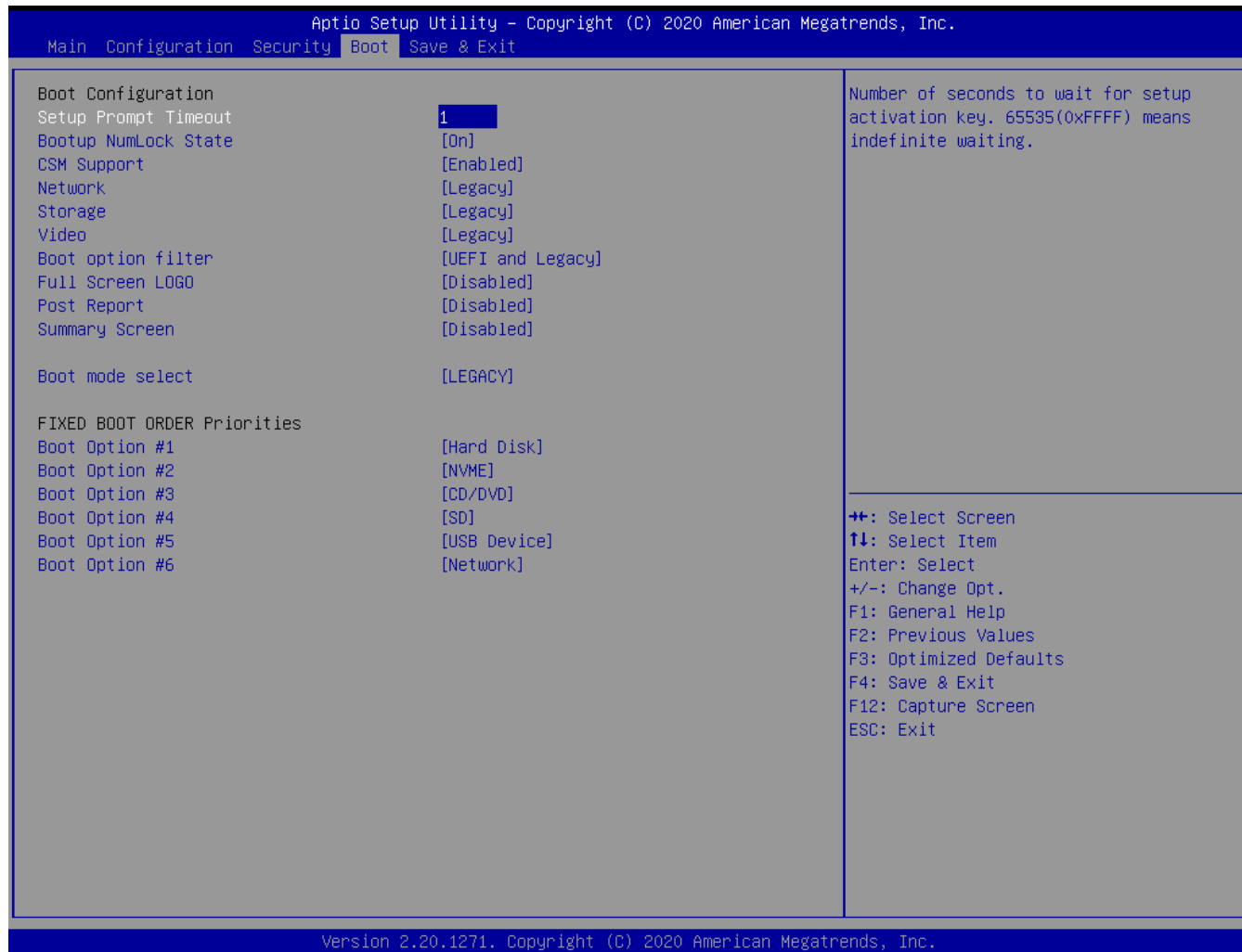
5.2.3 Security



Feature	Description	Options
Password Check Mode	[Setup] check password when enter setup screen. [Power on] check password on every time system power on.	★ Setup, Power on
Administrator Password	Set Administrator Password	

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5.2.4 Boot

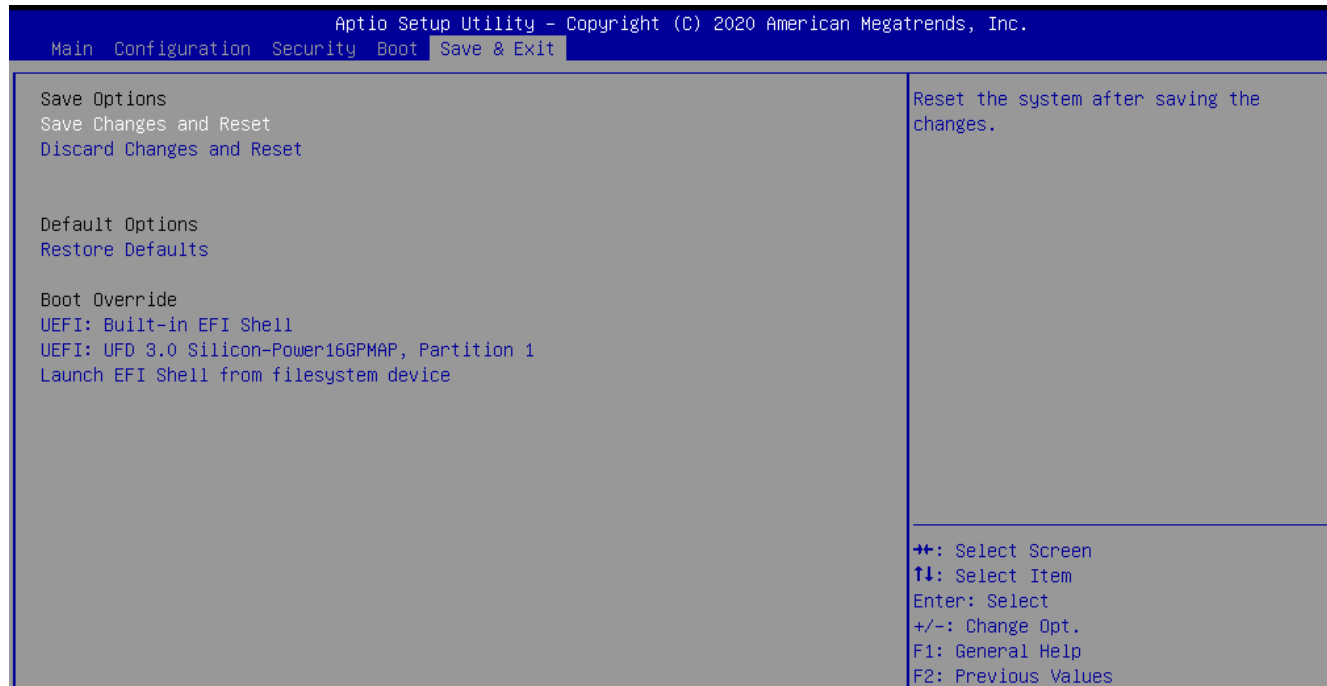


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Feature	Description	Options
Setup Prompt Timeout	Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.	★1
Bootup NumLock State	Select the keyboard NumLock state	★On, Off
CSM Support	Enable/Disable CSM support	★Disabled, Enabled
CSM Support[Enable]		
Network	Controls the execution of UEFI and Legacy Network OpROM	★Legacy ,Do not launch, UEFI
Storage	Controls the execution of UEFI and Legacy Storage OpROM	★Legacy ,Do not launch, UEFI
Video	Controls the execution of UEFI and Legacy Video OpROM	★Legacy ,Do not launch, UEFI
Boot option filter	This option controls Legacy/UEFI ROMs priority.	★UEFI and Legacy, Legacy only, UEFI only
Full Screen LOGO	Enables or disables Quiet Boot option and Full Screen LOGO.	★Disabled, Enabled
Post Report	Post Report Support Enabled/Disabled	★Disabled, Enabled
Summary Screen	Summary Screen Support Enabled/Disabled	★Disabled, Enabled
Boot mode select	Select boot mode LEGACY/UEFI	★LEGACY,UEFI
Boot Option #1~6	Sets the system boot order	★Hard Disk, NVME,CD/DVD,SD, USB Device, Network, Disabled
UEFI Application Boot Priorities	Specifies the Boot Device Priority sequence from available UEFI Application	

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5.2.5 Save & Exit



Feature	Description	Options
Save Changes and Reset	Reset the system after saving the changes.	
Discard Changes and Reset	Reset system setup without saving any changes.	
Restore Defaults	Restore/Load Default values for all the setup options.	
UEFI: Built-in EFI Shell	Reset the system after saving the changes. (Boot option filter: UEFI only)	
Launch EFI Shell from filesystem device	Attempts to Launch EFI Shell application (Shell.efi) from one of the available filesystem devices.	

6 Troubleshooting

This section provides a few useful tips to quickly get ROBO-6912VG2AR running with success. This section will primarily focus on system integration issues, in terms of BIOS setting, and OS diagnostics.

6.1 Hardware Quick Installation

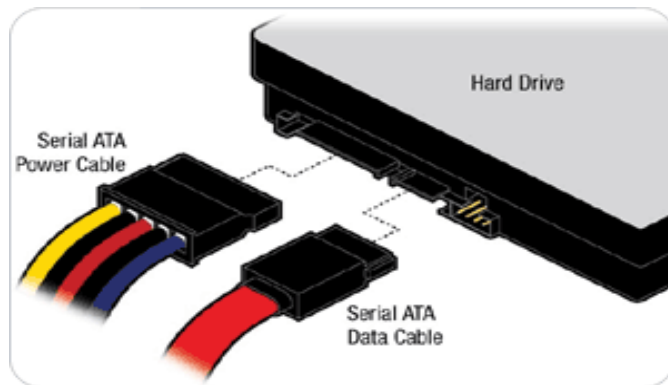
ATX Power Setting

Unlike other Single board computer, ROBO-6912VG2AR supports ATX only. Therefore, there is no other setting that needs to be set up. However, there are only two connectors that must be connected—J5 ATX 4 Pin Connector & 24 pins ATX Power Connector (On PICMG Backplane).

Serial ATA

Unlike IDE bus, each Serial ATA channel can only connect to one SATA hard disk at a time;

The installation of Serial ATA is simpler and easier than IDE, because SATA hard disk doesn't require setting up Master and Slave, which can reduce mistake of hardware installation.



ROBO-6912VG2AR can support two (J10/J12) SATA interface (SATAIII, 6.0Gb/s) one mSATA (J22) interface on board; The SATA interface shall support 1.5Gb/ 3.0Gb & 6.0Gb operation per the SATA specification.

6.2 BIOS Setting

It is assumed that users have correctly adopted modules and connected all the devices cables required before turning on ATX power. DDR4 SO-DIMM Memory, keyboard, mouse, SATA hard disk, Mini-DP connector, power cable of the device, ATX accessories are good examples that deserve attention. With no assurance of properly and correctly accommodating these modules and devices, it is very possible to encounter system failures that result in malfunction of any device.

To make sure that you have a successful start with ROBO-6912VG2AR, it is recommended, when going with the boot-up sequence, to hit "delete " or " Esc" key and enter the BIOS setup menu to tune up a stable BIOS configuration so that you can wake up your system far well.

Loading the default optimal setting

When prompted with the main setup menu, please scroll down to "Restore Defaults", press "Enter" and select "Yes" to load default optimal BIOS setup. This will force your BIOS setting back to the initial factory configurations. It is recommended to do this so you can be sure the system is running with the BIOS setting that Portwell has highly endorsed. As a matter of fact, users can load the default BIOS setting at any time when system appears to be unstable in boot up sequence.

6.3 FAQ

Information & Support

Question: I forgot my password of system BIOS, what am I supposed to do?

Answer: You can switch off your power supply then find the JP5 on the ROBO-6912VG2AR SBC to set it from 1-2 short to 2-3 short and wait 5 seconds to clean your password then set it back to 1-2 short to switch on your power supply.

JP5: Clear CMOS Setup



PIN No.	Description
1-2, Short	Normal
2-3, Short	Clear CMOS

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Question: How to update the BIOS file of ROBO-6912VG2AR?

Step1. Please visit web site of **Portwell download center** as below hyperlink http://www.portwell.com.tw/support/download_center.php

Registering an account in advance is a must. (The E-Mail box should be an existing Company email address that you check regularly.)

<http://www.portwell.com.tw/member/newmember.php>

Step2. Type in your User name and password and log in the download center.

Step3. Select "**Search download**" and type the keyword "**ROBO-6912VG2AR-A**".

Step4. Find the "**BIOS**" page and download the ROM file and flash utility.

Step5. Unzip file to bootable USB flash drive which can boot to dos mode. Then execute the "**update.bat**" or "**update.efi**". It will start to update Step BIOS.

NOTE: Once you use "update.efi" to update BIOS, it must be get into the SHELL MODE to update BIOS

Step6. When you see the "**FPT Operation Passed**" message, which means the BIOS update processes finished. Please cut the AC power off and **wait for 10seconds** before powering on.

Step7. When you see the "**Programming success**" message, which means the BIOS update processes finished. Please cut the AC power off and **wait for 10 seconds** before powering on.

7 Portwell Software Service

1. If you have customized requirements of BIOS, you can contact person of our company or branch.
2. If you have requirements of WDT 、GPIO APP, you can contact our headquarter or branch, and we can render you assistance on developing.

Portwell Worldwide:	
<u>Portwell, Inc.</u>	E-mail: info@portwell.com.tw
<u>Shanghai Portwell</u>	E-mail: info@portwell.com.cn
<u>Portwell Japan, Inc</u>	E-mail: info@portwell.co.jp
<u>American Portwell Technology</u>	E-mail: info@portwell.com
<u>European Portwell Technology</u>	E-mail: info@portwell.eu
<u>Portwell UK Ltd.</u>	E-mail: info@portwell.co.uk
<u>Portwell Deutschland GmbH</u>	E-mail: info@portwell.eu
<u>Portwell India Technology</u>	E-mail: info@portwell.in
<u>Portwell Korea, Inc.</u>	E-mail: info@portwell.co.kr
<u>Portwell Latin America</u>	E-mail: vendas@portwell.com.br

8 Industry Specifications

8.1 Industry Specifications

The list below provides links to industry specifications that apply to Portwell modules.

Low Pin Count Interface Specification, Revision 1.0 (LPC) <http://www.intel.com/design/chipsets/industry/lpc.htm>

Universal Serial Bus (USB) Specification, Revision 2.0 <http://www.usb.org/home>

PCI Specification, Revision 2.3 <https://www.pcisig.com/specifications>

Serial ATA Specification, Revision 3.0 <http://www.serialata.org/>

PCI Express Base Specification, Revision 2.0 <https://www.pcisig.com/specifications>