NANO-6051

NANO-ITX Embedded Motherboard

Version 1.1

Revision History

R1.0	Preliminary
R1.1	Update Mechanical Dimensions / Block Diagram

Contents

Preface

This user's guide provides information about the components, features, connectors and BIOS Setup menus available on the NANO-6051. This document should be referred to when designing NANO-ITX application. The other reference documents that should be used include the following:

- ✧ Intel Whiskey Lake-U Design Guide
- ✧ Intel Whiskey Lake-U Specification

Please contact Portwell Sales Representative for above documents.

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1 Introduction

Portwell Inc., a world-leading innovator in the Industrial PC (IPC) market and a member of the Intel® Embedded and Communications Alliance (Intel ECA), announced today the Portwell NANO-6051 utilizing the NANO-ITX form factor based on the Intel® Whiskey Lake-U processor . The NANO-6051 supports one DDR4 SO-DIMM socket up to 32GB system memory and comes with one M.2 E key socket, one M.2 M key socket, Dual mini DP ports, two GbE ports, one COM port support RS-232/422/485, four USB3.1(Gen1) on board and two USB3.1(Gen2) on REAR IO. The NANO-6051 can provide the low power consumption for low profile fanless applications such as POS, Print Imaging, ATM, Kiosk, Medical, Panel PC, Digital Security and Digital Signage.

2 Specifications

Main Processor	◆ Intel® Whiskey lake -U series Processor
System BIOS	◆ AMI UEFI BIOS
Main Memory	◆ Up to 32 GB in one DDR4 SO-DIMM socket ◆ Supports DDR4 2400 MHz
Graphics	◆ Controller: Intel® HD Graphics 620 ◆ DP: Supports two mini DP on rear I/O up to 4096x2304 resolution
Expansion Interface	◆ One M.2(NGFF) E key socket for wireless application
SATA Interface	◆ One M.2 M key socket for SSD application
Input/Output	◆ Serial Port: 1x RS-232/422/485, switched by BIOS ◆ USB Port: 2x USB 3.1(Gen2) on rear I/O, 4x USB 3.1(Gen1) on board header ◆ Audio Interface: Audio jack on rear I/O with Line-out and on board pin header with Line-in, Line- out, and Mic-in.
Ethernet	◆ Supports dual 10/100/1000 Mbps Ethernet port (s) via PCI Express x1 bus. ◆ Controller: Intel I210AT / I219LM
High Drive GPIO	◆ One pin-header for GPIO(8bit in / out)

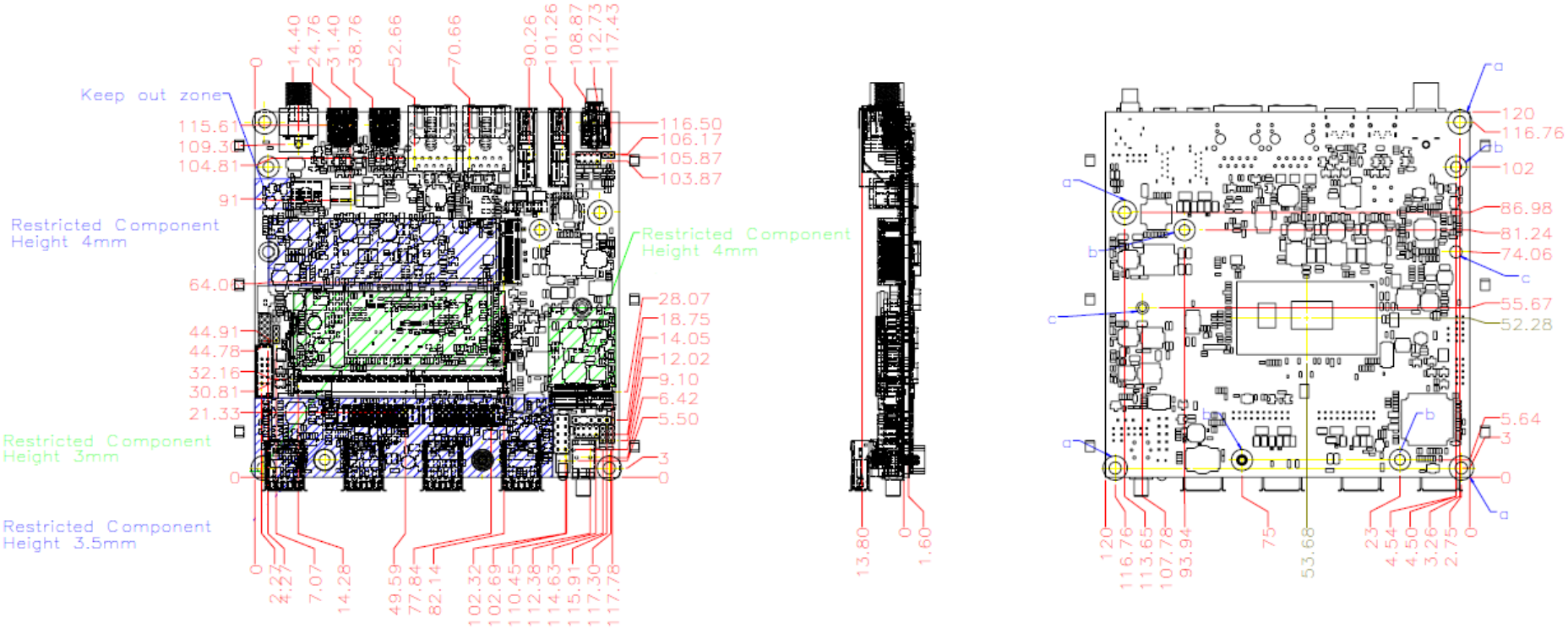
Mechanical and environmental specifications	◆ Operating temperature: 0 ~ 60° C ◆ Storage temperature:-40 ~ 85° C ◆ Humidity: 5 ~ 95% non-condensing ◆ Power supply voltage: 12V DC in ◆ Board size: 120mm x 120 mm (4.72" x 4.72")

2.1 Supported Operating Systems

The NANO-6051 supports the following operating systems.

- ✧ Windows* 10 IoT Enterprise RS5 (64b)
- ✧ Ubuntu*, SUSE, Red Hat* Enterprise (64b)
- ✧ Yocto Project* BSP tool-based embedded Linux distribution (64b)
- ✧ Wind River VxWorks* 7 (64b)

2.2 Mechanical Dimensions



2.3 Power Consumption

Test Configuration	
CPU Type	Intel® Core™ i5-8365UE CPU @ 1.60GHz
SBC BIOS	Portwell, Inc. NANO-6051 BIOS Rev.:0.0.3 (11052019)
Memory	Samsung DDR4 SO-DIMM 2666/32GB *1
VGA Card	Onboard Intel® UHD Graphics 620
VGA Driver	Intel® HD Graphics 620 , Version: 26.20.100.7158
LAN Card #1	Onboard Intel® Ethernet Connection I219-LM
LAN Driver #1	Intel® Ethernet Connection I219-LM , Version:12.18.9.10
LAN Card #2	Onboard Intel® I210 Gigabit Network
LAN Driver #2	Intel® I210 Gigabit Network , Version:12.18.9.1
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	Intel® Chipset Software , Version: 10.1.27.2
USB 3.0 Driver	Intel® USB3.1 eXtensible Host Conntroller-1.10(Microsoft),Ver:10.0.18362.1
EC Version	R00.E05 (10/14/2019)
CPU ID	000806EC

Power consumption(12V)			
ATX:			
Item	Power ON	Full Loading 10Min	Full Loading 30Min
CPU +12V	0.9 A	2.2 A	1.7 A
USB 3.0 Loading Test	4.93V/ 970 mA		

2.4 Environmental Specifications

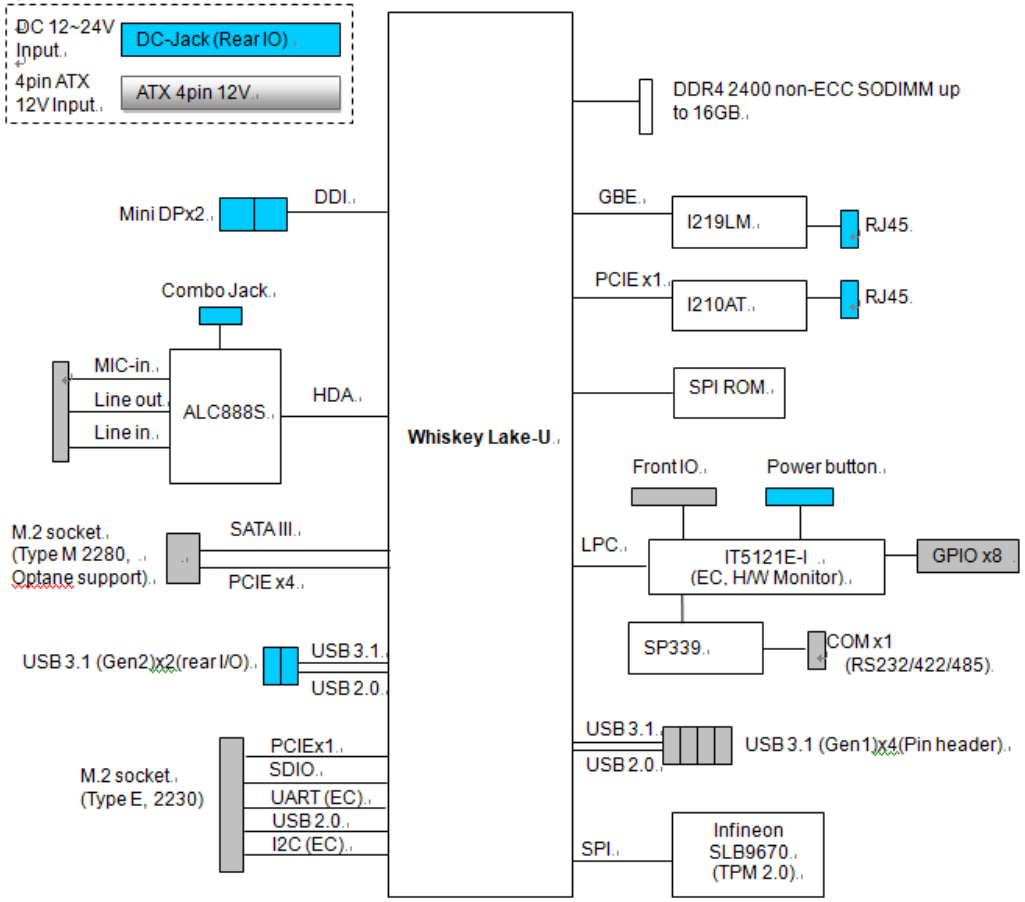
Storage Temperature : -40~85°C

Operation Temperature : 0~60°C

Storage Humidity : 5~95%

Operation Humidity: 10~90%

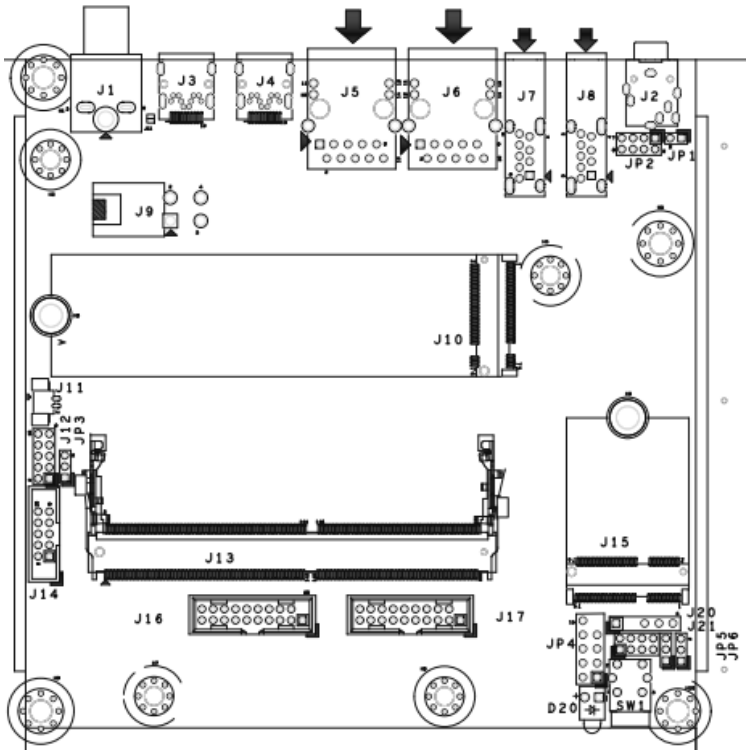
3 Block Diagram



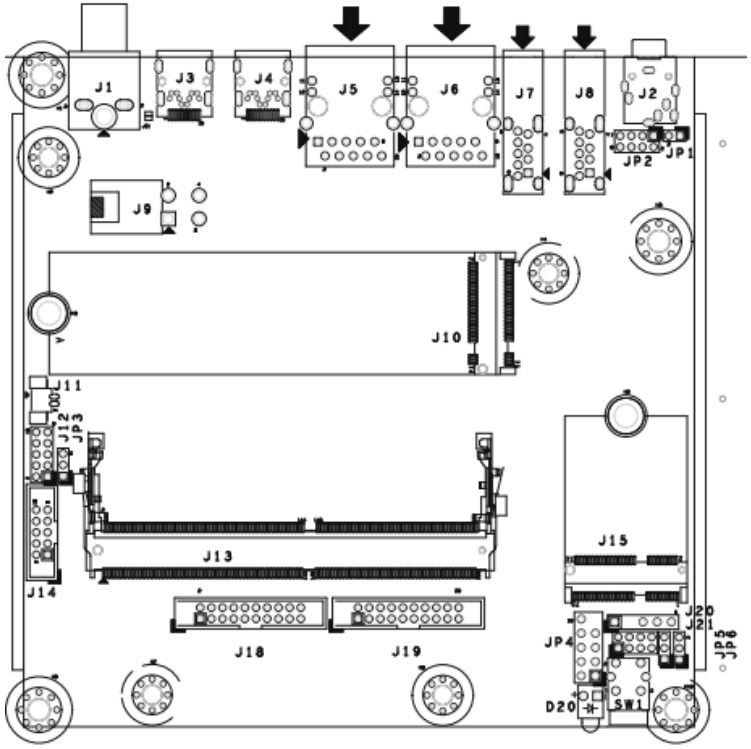
4 Hardware Configuration

4.1 Jumpers and Connectors

Note. Top side with J16/J17



Note. Top side with J18/J19



4.2 Jumper Settings

For users to customize NANO-6051'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:

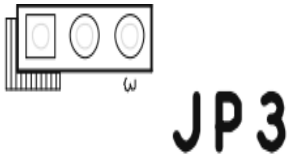
Jump Function List:

Jumper	Function	Remark
JP1	Combo Jack Microphone setting	PH2Px1/2mm
JP3	EC' GPO voltage level selection	Header5Px2/2mm
JP5	AT/ATX Mode selection	PH3Px1/2mm
JP6	Clear CMOS	PH3Px1/2mm

JP1: Combo Jack Microphone setting

PIN No.	Description
1-2, Short	No stereo Microphone
1-2, Open	Normal

JP3: EC' GPO voltage level selection

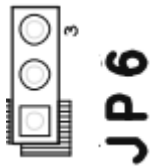


PIN No.	Description
1-2, Short	Select 5V
2-3, Short	Select 3.3V

JP5: ATX/AT Mode selection

PIN No.	Description
1-2 Short	AT mode
2-3 Short	ATX mode

JP6: Clear CMOS



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

4.3 Connector Settings

Connector Allocation

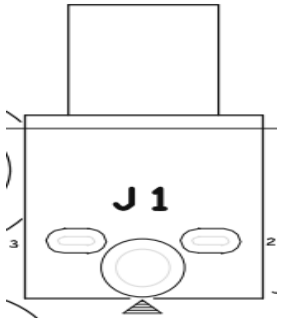
I/O peripheral devices are connected to the interface connectors

Connector Function List

Connector	Function	Remark
J1	DC-in Jack	
J2	Combo Audio Jack	
J3	Mini DP (DDI1)	
J4	Mini DP (DDI2)	
J5	RJ-45 (i219)	
J6	RJ-45 (i210)	
J7	USB2.0/3.0(Gen2) Connector (Type-A)	Port1
J8	USB2.0/3.0(Gen2) Connector (Type-A)	Port2
J9	ATX 4P Connector (+12v)	
J10	M2 2280 Connector (M-Key)	NVMe/SATA
J11	RTC Battery Connector	3WAFER2x1P
J12	GPIO Pin Header	Header5Px2/2mm

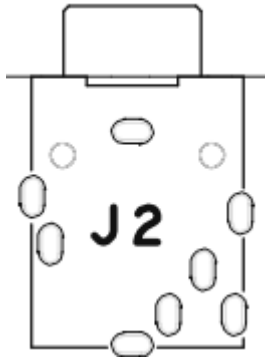
J13	DDR4 Memory Socket (Channel B)	
J14	COM port Connector	BH5Px2/2mm
J15	M2 2230 Connector (E-Key)	
J16/J17	USB2.0/3.1(Gen1) Connector	BH10Px2/2.0mm
J18/J19	USB2.0/3.1(Gen1) Connector	BH10Px2/2.0mm
J20	EC's SMBUS debug Pin header	PH5Px1-Pin2/2.54mm
J21	Front Panel Pin header	Header4Px2/2mm
JP2	Audio pin header	Header4Px2/2mm
JP4	Port80 Pin header	Header5Px2-Pin9/2.54mm

J1: DC-in Jack



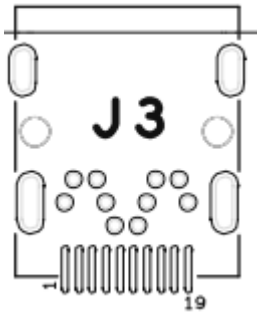
PIN No.	Description
1	PWR_LED (+)
3	PWR_LED (-)
5	I219_LAN (+)

J2: Combo Audio Jack



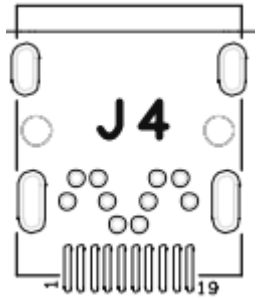
PIN No.	Description
1	GNDAU
2	FRNT_OUT_B_L
3	FRNT_OUT_T_R
4	N/C
5	N/C
6	MIC_IN_B_L
7	CGND
8	CGND

J3：Mini DP Connector (DDI1)



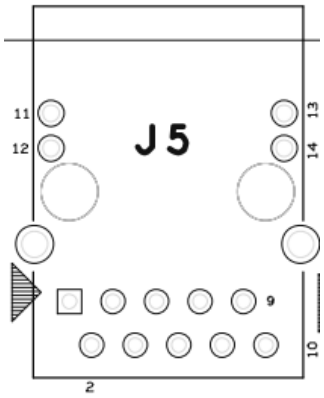
PIN No.	Description	PIN No.	Description
1	GND	2	DP_HPD1#
3	DDI1_R_TXP0	4	OC_AUX_EN1#
5	DDI1_R_TXN0	6	CFG2
7	GND	8	GND
9	DDI1_R_TXP1	10	DDI1_R_TXP3
11	DDI1_R_TXN1	12	DDI1_R_TXN3
13	GND	14	GND
15	DDI1_R_TXP2	16	DPD_OC_AUX_P
17	DDI1_R_TXN2	18	DPD_OC_AUX_N
19	GND	20	DP_PWR
CG1	CGND	CG2	CGND
CG3	CGND	CG4	CGND

J4: Mini DP Connector (DDI2)



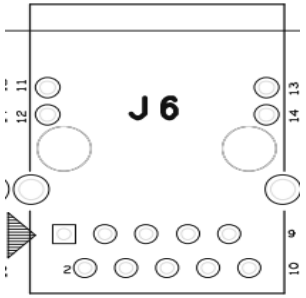
PIN No.	Description	PIN No.	Description
1	GND	2	DP_HPD2#
3	DDI2_R_TXP0	4	OC_AUX_EN2#
5	DDI2_R_TXN0	6	CFG2
7	GND	8	GND
9	DDI2_R_TXP1	10	DDI2_R_TXP3
11	DDI2_R_TXN1	12	DDI2_R_TXN3
13	GND	14	GND
15	DDI2_R_TXP2	16	DPD_OC_AUX_P
17	DDI2_R_TXN2	18	DPD_OC_AUX_N
19	GND	20	DP_PWR
CG1	CGND	CG2	CGND
CG3	CGND	CG4	CGND

J5: RJ-45 Connector



PIN No.	Description	PIN No.	Description
1	L1_MDI0_P	2	L1_MDI0_N
3	L1_MDI1_P	4	L1_MDI1_N
5	Center Tap	6	Center Tap
7	L1_MDI2_P	8	L1_MDI2_N
9	L1_MDI3_P	10	L1_MDI3_N
11	L1_LED1	12	L1_LED2
13	L1_LED0	14	+V3P3A
CG1	CGND	CG2	CGND

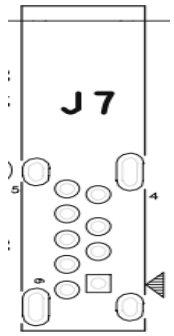
J5: RJ-45 Connector



PIN No.	Description	PIN No.	Description
1	L2_MDI0_P	2	L2_MDI0_N
3	L2_MDI1_P	4	L2_MDI1_N
5	Center Tap	6	Center Tap
7	L2_MDI2_P	8	L2_MDI2_N
9	L2_MDI3_P	10	L2_MDI3_N
11	L2_LED1	12	L2_LED2
13	L2_LED0	14	+V3P3A
CG1	CGND	CG2	CGND

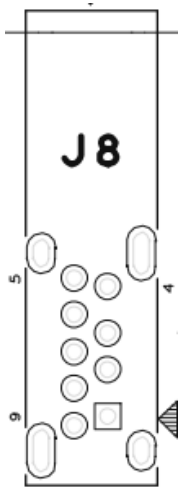
J7: USB2.0/USB3.1(Gen2) Connector

PIN No.	DESCRIPTION
1	VUSB_V1
2	USB2_P1_DN_R
3	USB2_P1_DP_R
4	Ground
5	USB3_RX1_DN_R
6	USB3_RX1_DP_R



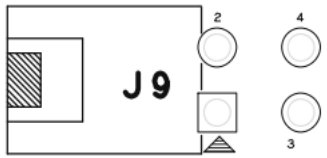
7	Ground
8	USB3_TX1_DN_R
9	USB3_TX1_DP_R

J8: USB2.0/USB3.1(Gen2) Connector



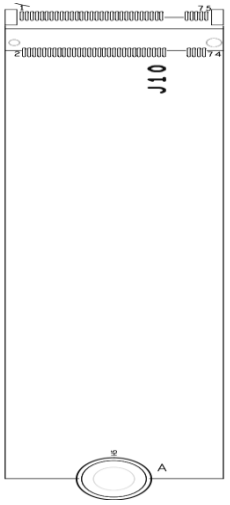
PIN No.	DESCRIPTION
1	VUSB_V1
2	USB2_P1_DN_R
3	USB2_P1_DP_R
4	Ground
5	USB3_RX1_DN_R
6	USB3_RX1_DP_R
7	Ground
8	USB3_TX1_DN_R
9	USB3_TX1_DP_R

J9: ATX 4P Connector



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

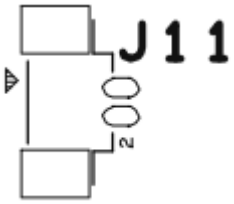
J10: M2 2280 Connector (M-Key)



PIN No.	Description	PIN No.	Description
1	GND	2	VCC3
3	GND	4	VCC3
5	PCIE9_RXN	6	N/C
7	PCIE9_RXP	8	N/C
9	GND	10	M2_SATA_LED#
11	PCIE9_TXN	12	VCC3
13	PCIE9_TXP	14	VCC3
15	GND	16	VCC3
17	PCIE10_RXN	18	VCC3
19	PCIE10_RXP	20	N/C
21	GND	22	N/C
23	PCIE10_TXN	24	N/C
25	PCIE10_TXP	26	N/C
27	GND	28	N/C
29	PCIE11_RXN	30	N/C
31	PCIE11_RXP	32	N/C
33	GND	34	N/C
35	PCIE11_TXN	36	N/C

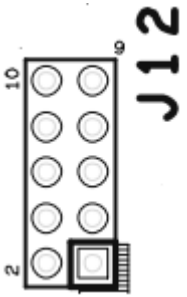
37	PCIE11_TXP	38	M2_DEVSLP
39	GND	40	N/C
41	RX0_N/SATA_B+	42	N/C
43	RX0_P/SATA_B-	44	N/C
45	GND	46	N/C
47	TX0_N/SATA_A-	48	N/C
49	TX0_P/SATA_A+	50	BUF_M2_PLTRST#
51	GND	52	CK_PCIE_M2M_REQ#
53	CLK_PCIE_M2_2280_N	54	M.2_PCIE_WAKE_N
55	CLK_PCIE_M2_2280_P	56	N/C
57	GND	58	N/C
59	KEY-M	60	KEY-M
61	KEY-M	62	KEY-M
63	KEY-M	64	KEY-M
65	KEY-M	66	KEY-M
67	N/C	68	SUS_CLK
69	SATA#_PCIE_SEL	70	VCC3
71	GND	72	VCC3
73	GND	74	VCC3
75	GND		

J11: RTC Battery Connector



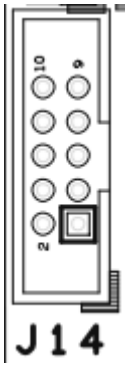
PIN No.	Description
1	BAT3V
2	GND

J12: GPIO Pin Header



PIN No.	Description	PIN No.	Description
1	GPI_0	2	GPO_0
3	GPI_1	4	GPO_1
5	GPI_2	6	GPO_2
7	GPI_3	8	GPO_3
9	Ground	10	VCC

J14: COM Port Pin Header

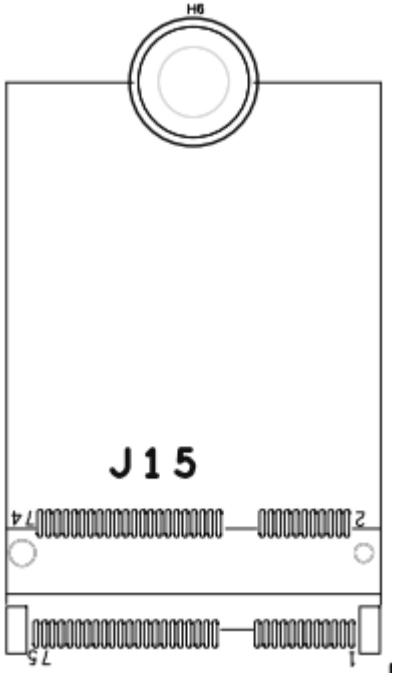


PIN No.	Description	PIN No.	Description
1	DCD#1/DT-	2	RXD#1/DT+
3	TXD#1/422R+	4	DTR#1/422R-
5	GND	6	DSR#1
7	RTS#1	8	CTS#1
9	RI#1	10	N/C

J15: M2 2230 Connector (E-Key)

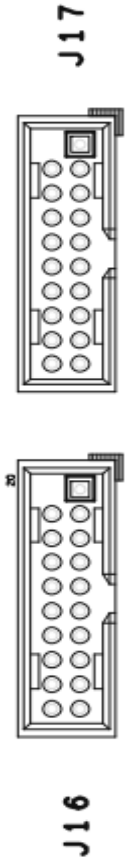
PIN No.	Description	PIN No.	Description
1	Ground	2	3.3V
3	USB2_2P_10	4	3.3V
5	USB2_2N_10	6	N/C
7	GND	8	N/C
9	SD_CLK	10	N/C
11	SD_CMD	12	N/C

13	SD_D0	14	N/C
15	SD_D1	16	N/C
17	SD_D2	18	GND
19	SD_D3	20	UART_BT_ALERT#
21	SDIO_WAKE_N	22	M.2_RXD
23	BUF_M2_PLTRST#	24	E-Key
25	E-Key	26	E-Key
27	E-Key	28	E-Key
29	E-Key	30	E-Key
31	E-Key	32	M.2_TXD
33	GND	34	M.2_CTS_N
35	PCIE14_TXP	36	M.2_RTS_N
37	PCIE14_TXN	38	M2_E_CLRST#
39	GND	40	M2_CL_DAT
41	PCIE14_RXP	42	M2_E_CL_CLK
43	PCIE14_RXN	44	N/C
45	GND	46	N/C
47	CLK_PCIE_M2_2230_P	48	N/C
49	CLK_PCIE_M2_2230_N	50	SUS_CLK
51	GND	52	BUF_M2_PLTRST#



53	CK_PCIE_M2E_REQ#	54	M2_KILL_BT#
55	M.2_PCIE_WAKE#	56	M2_KILL_WIFI#
57	GND	58	N/C
59	N/C	60	N/C
61	N/C	62	N/C
63	GND	64	N/C
65	N/C	66	N/C
67	N/C	68	N/C
69	GND	70	N/C
71	N/C	72	3.3V
73	N/C	74	3.3V
75	GND		

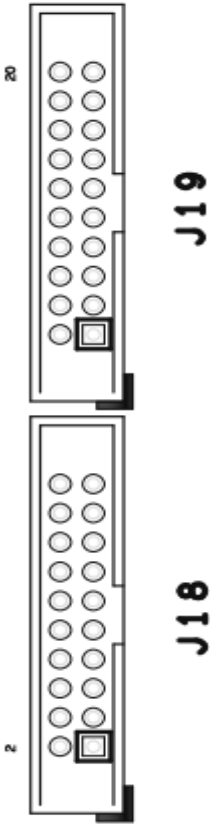
J16/J17: USB2.0/3.1(Gen1) Connector



PIN No.	Description	PIN No.	Description
1	VUSB_V3		
2	USB3_RX3_DN_R	19	VUSB_V3
3	USB3_RX3_DP_R	18	USB3_RX4_DN_R
4	GND	17	USB3_RX4_DP_R
5	USB3_TX3_DN_R	16	GND
6	USB3_TX3_DP_R	15	USB3_TX4_DN_R
7	GND	14	USB3_TX4_DP_R
8	USB2_P3_DN_R	13	GND
9	USB2_P3_DP_R	12	USB2_P4_DN_R
10	GND	11	USB2_P4_DP_R

PS. J16 is for USB port 3 and 4, J17 is for USB port5 and 6.

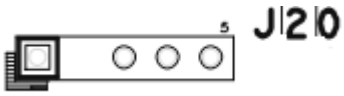
J18/J19: USB2.0/3.1(Gen1) Connector



PIN No.	Description	PIN No.	Description
1	GND	2	USB2_P4_DP_R
3	USB2_P3_DP_R	4	USB2_P4_DN_R
5	USB2_P3_DN_R	6	GND
7	GND	8	USB3_TX4_DP_R
9	USB3_TX3_DP_R	10	USB3_TX4_DN_R
11	USB3_TX3_DN_R	12	GND
13	GND	14	USB3_RX4_DP_R
15	USB3_RX3_DP_R	16	USB3_RX4_DN_R
17	USB3_RX3_DN_R	18	VUSB_V3
19	VUSB_V3	20	N/C

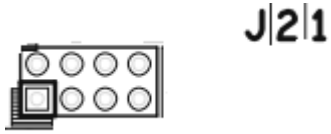
PS. J18 is for USB port 3 and 4, J19 is for USB port5 and 6.
PS. J18/J19 is default connector (Blue color)

J20: EC's SMBUS Debug Pin Header



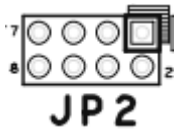
PIN No.	Description
1	SMB1_CLK_MAIN
3	GND
4	SMB1_DATA_MAIN
5	VCC5

J21: Front Panel Pin Header



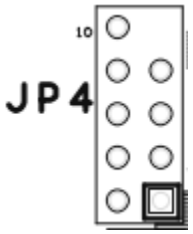
PIN No.	Description	PIN No.	Description
1	VCC5	2	SATA_LED_N
3	VCC5	4	BUZZER
5	RST_BTN_N	6	GND
7	GND	8	EXT_PWRBTN#

JP2: Audio Pin Header



PIN No.	Description	PIN No.	Description
1	MIC_IN_B_L	2	LINE_IN_B_L
3	GNDAU	4	LINE_IN_T_R
5	FRNT_OUT_B_L	6	GNDAU
7	FRNT_OUT_T_R	8	MIC_IN_T_R

JP4: Port 80 Pin Header



PIN No.	Description	PIN No.	Description
1	LAD0	2	VCC3
3	LAD1	4	PLT_RST_5121#
5	LAD2	6	LFRAME#
7	LAD3	8	80H_LPC1CLK
		10	GND

5 Signal Descriptions

5.1 Watch Dog Signal

```
#Define WDTCFG 0x06          // WDT Timer Coutrol Register
#Define WDTMIN 0x07          // WDT Timer Counter Register (Minute)
#Define WDTSEC 0x08          // WDT Timer Counter Register (Second)
#Define EC_IOPort 0xE300     // Default, reference to BIOS configuration


VOID    Write_EC_SRAM(UINT8 Offset,UINT8 Value){
        IoWrite8(EC_IOPort+Offset,Value);
}

Byte Read_EC_SRAM(UINT8 Offset){
        IoRead8(EC_IOPort+offset,Value);
        return Value;
}

void WDT()
```

```
{
	// Enable WDT 30sec
	Write_EC_SRAM(WDTSEC,30);
	Write_EC_SRAM(WDTCFG,0x01);	//Bit0: WDT Enable, BIT1: 0:Second Mode

	// Enable WDT 5min
	Write_EC_SRAM(WDTSEC,5);
	Write_EC_SRAM(WDTCFG,0x03);	//Bit0: WDT Enable, BIT1: 1:Minute Mode

	// Enable WDT 10min, 20sec
	Write_EC_SRAM(WDTSEC,20);
	Write_EC_SRAM(WDTSEC,10);
	Write_EC_SRAM(WDTCFG,0x03);	//Bit0: WDT Enable, BIT1: 1:Minute Mode
}
```

5.2 Signal GPIO Signal

```
#Define GPCR 0x2B        // GPIO Coutrol Register, Bit7 = GPO3, Bit6 = GPO2, ...,
                         //                        Bit3 = GPI3, Bit2 = GPI2, ...,
                         // 0: Output; 1: Input

#Define GPDR 0x2C        // GPIO Status Register, Bit7 = GPO3, Bit6 = GPO2, ...,
                         //                       Bit3 = GPI3, Bit2 = GPI2, ...,
                         // 0: Low; 1: High

#Define EC_IOPort 0xE300            // Default, reference to BIOS configuration

VOID Write_EC_SRAM(UINT8 Offset,UINT8 Value){
      IoWrite8(EC_IOPort+Offset,Value);
}

Byte Read_EC_SRAM(UINT8 Offset){
      IoRead8(EC_IOPort+offset,Value);
      return Value;
}

void GPIO()
```

```
{
	int Temp;
	// Get GPI status
	Temp = Read_EC_SRAM(GPDR);			//Bit3-0: GPI3-0 status

	// Set GPO4 Output & High
	Temp = Read_EC_SRAM(GPDR);
	Write_EC_SRAM(GPDR,Temp|0x80);			//Bit7-4: Set GPO3-0 status, 0: Low 1: High
}
```

6 System Resources

6.1 Intel® Whiskey Lake - U SoC

Intel Core i7-8665UE 1.7GHz Quad Core (8M Cache, up to 4.40 GHz)
Intel Core i5-8365UE 1.6GHz Quad Core (6M Cache, up to 4.10 GHz)
Intel Core i3-8145UE 2.2GHz Dual Core (4M Cache, up to 3.90 GHz)

6.2 Main Memory

NANO-6051 provides 1 x 260-pin SO-DIMM sockets which supports DDR4 non-ECC memory. The maximum memory can be up to 32GB. 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.

6.3 Installing the Single Board Computer

To install your NANO-6051 into standard chassis or proprietary environment, please perform the following:
Step 1 : Check all jumpers setting on proper position
Step 2 : Install and configure memory module on right position
Step 3 : Place NANO-6051 into the dedicated position in the system
Step 4 : Attach cables to existing peripheral devices and secure it

WARNING

Please ensure that motherboard is properly inserted and fixed by mechanism.

Note:

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

6.3.1 Chipset Component Driver

The NANO-6051 build with Intel® Whiskey lake-U process . 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 10, please install its INF before any of other Drivers are installed. You can find very easily this chipset component driver in NANO-6051 CD-title

6.3.2 Intel® HD Graphics 620

NANO-6051 has integrated Intel® HD Graphics 620 Processor Graphics indicates graphics processing circuitry integrated into the processor, providing the graphics, compute, media, and display capabilities. Intel® HD Graphics, Iris™ Graphics, Iris Plus Graphics, and Iris Pro Graphics deliver enhanced media conversion, fast frame rates, and 4K Ultra HD (UHD) video.
NANO-6051 supports Dual mini DP port output. This combination makes NANO-6051 an excellent performance hardware.

Drivers Support
Please find the Graphic driver in the NANO-6051 CD-title. The driver supports Windows 10.

6.3.3 Intel LAN I210IT/I219LM Gigabit Ethernet Controller

- Intel I210AT Gigabit Ethernet controller and 1x RJ-45 connectors on rear I/O
- Intel I219LM Gigabit Ethernet controller and 1x RJ-45 connectors on rear I/O

Drivers Support
Please find Intel I210IT / I219LM LAN driver in Ethernet directory of NANO-6051 CD-title. The driver supports Windows 10.

7 BIOS Setup Items

7.1 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.

7.2 BIOS Setup

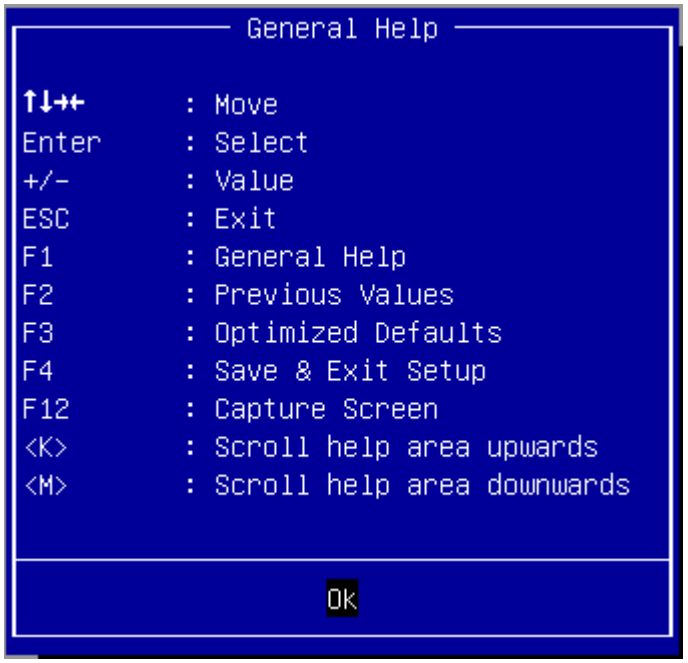
Power on the computer and the system will start POST (Power on Self Test) process. When the message below appears on the screen, press <Delete> or <ESC> key will enter BIOS setup screen.

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.

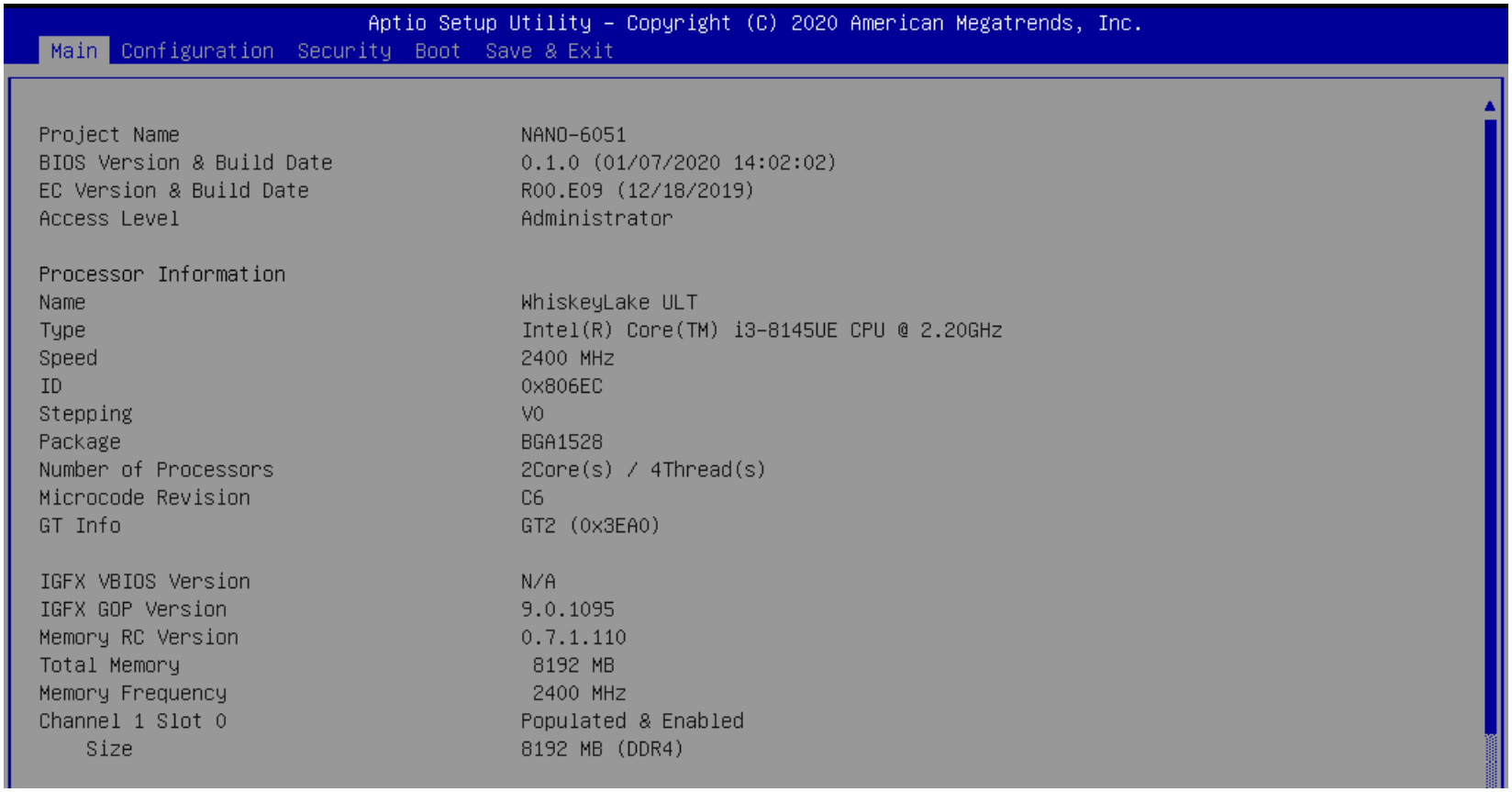
Press <F1> to Run General Help or Resume

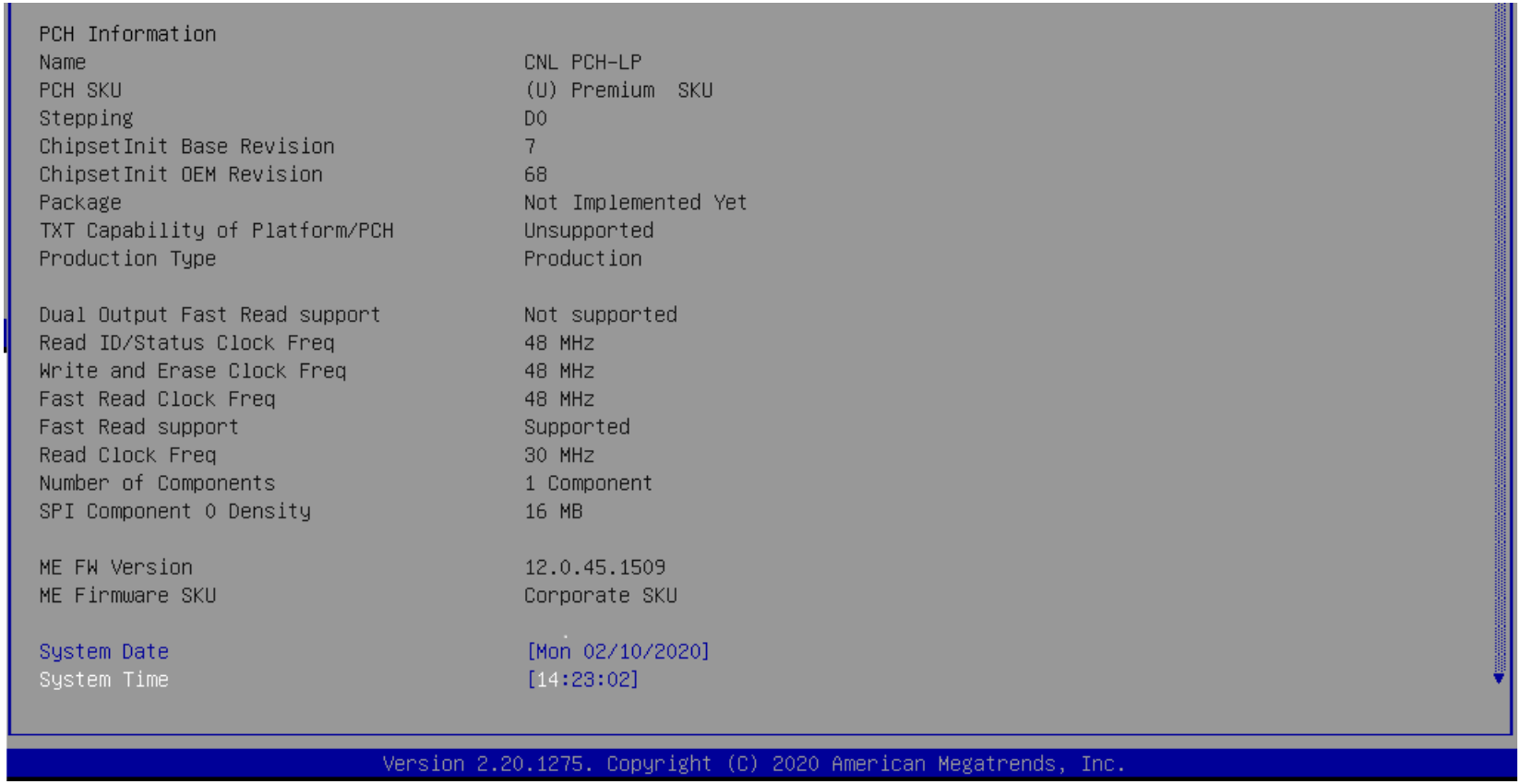
The BIOS setup program provides a General Help screen. The menu can be easily called up from any menu by pressing <F1>. The Help screen lists all the possible keys to use and the selections for the highlighted item. Press <Esc> to exit the Help Screen.


General Help
↑↓→← : Move
Enter : Select
+/- : Value
ESC : Exit
F1 : General Help
F2 : Previous Values
F3 : Optimized Defaults
F4 : Save & Exit Setup
F12 : Capture Screen
<K> : Scroll help area upwards
<M> : Scroll help area downwards
Ok

7.2.1 Main

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

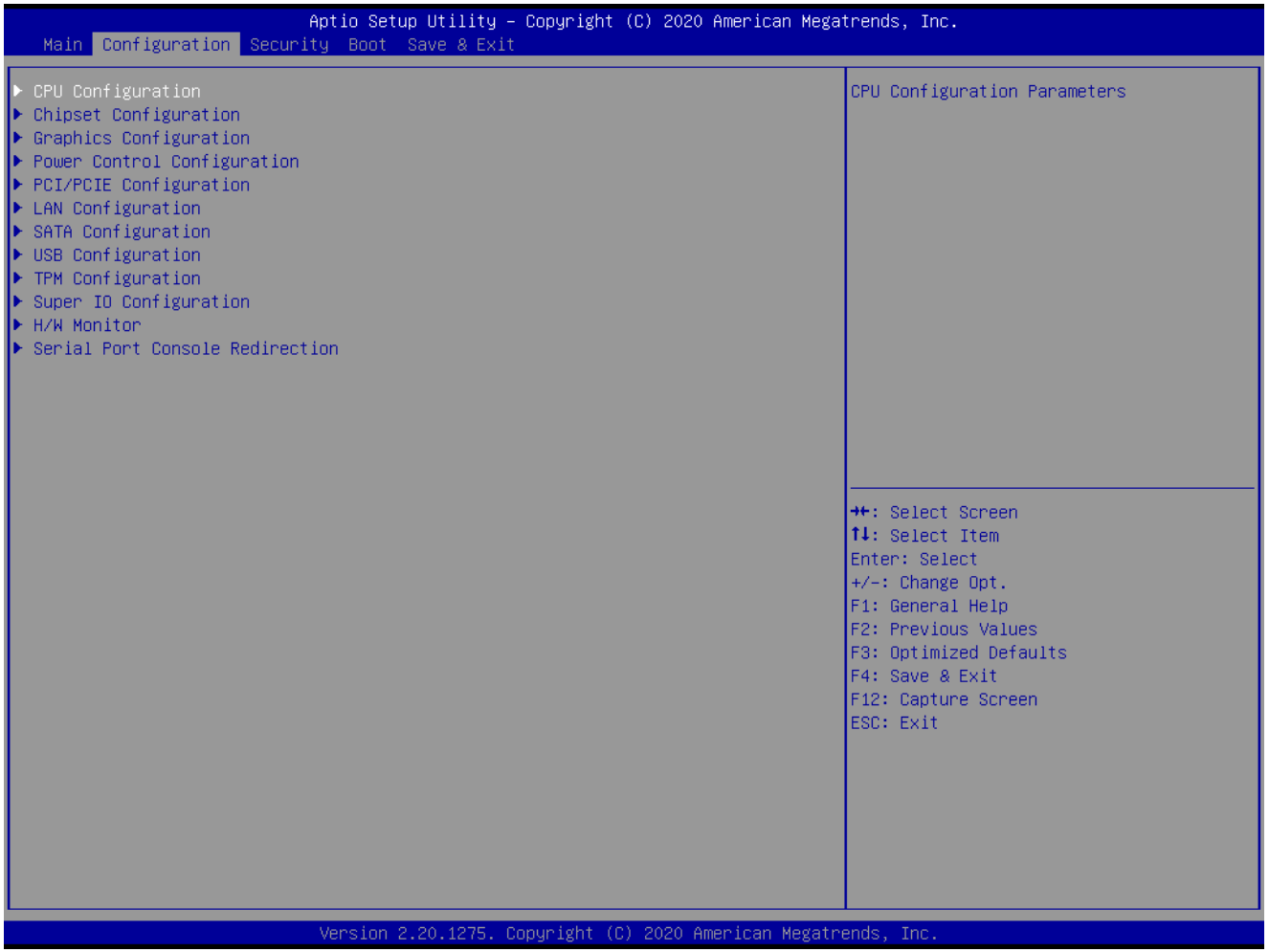




Feature	Description	Options
System Date	The date format is <Day>, <Month> <Date> <Year>. Use [+] or [—] to configure system Date.	
System Time	The time format is <Hour> <Minute> <Second>. Use [+] or [—] to configure system Time.	

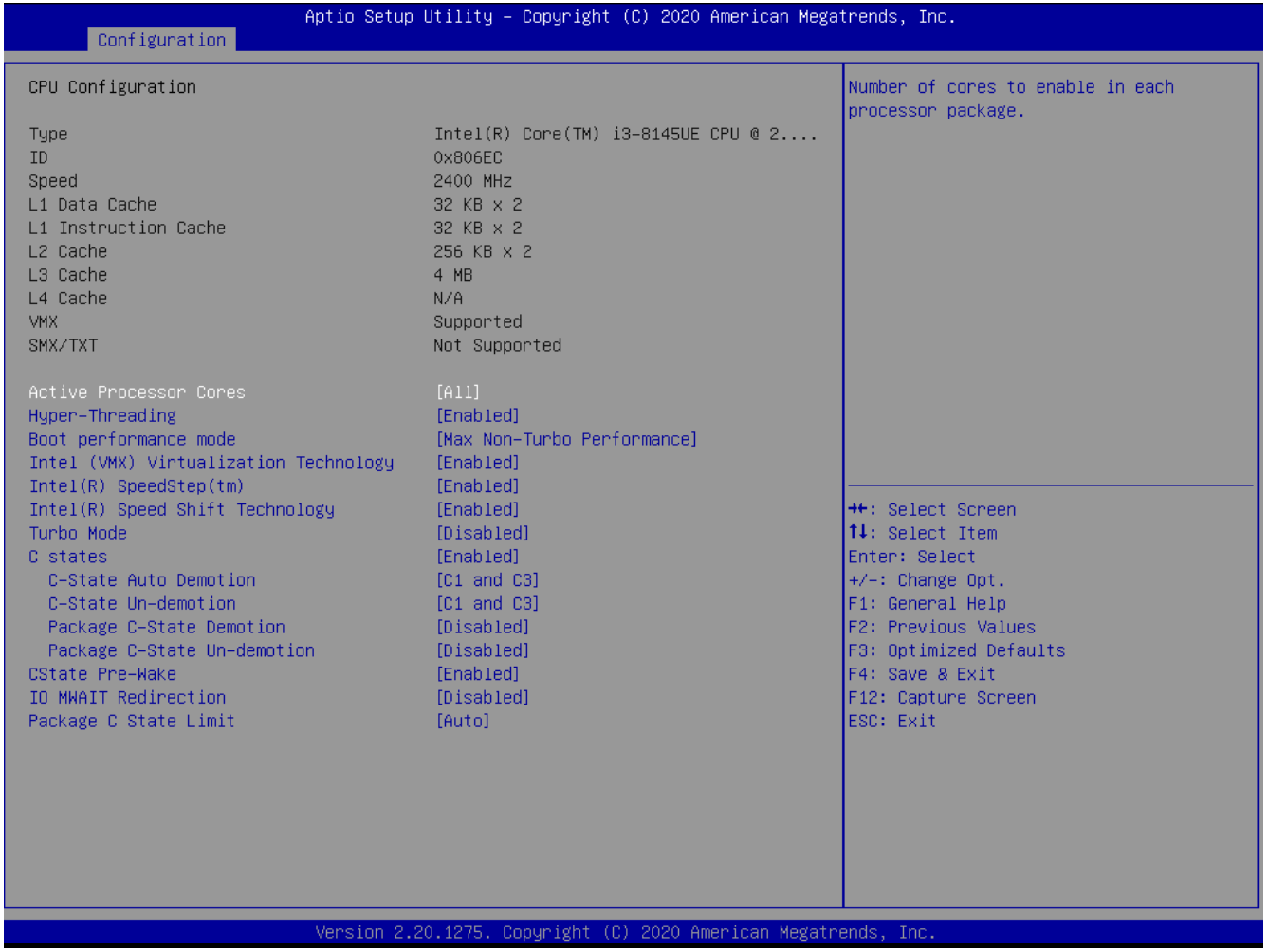
7.2.2 Configuration

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



CPU Configuration

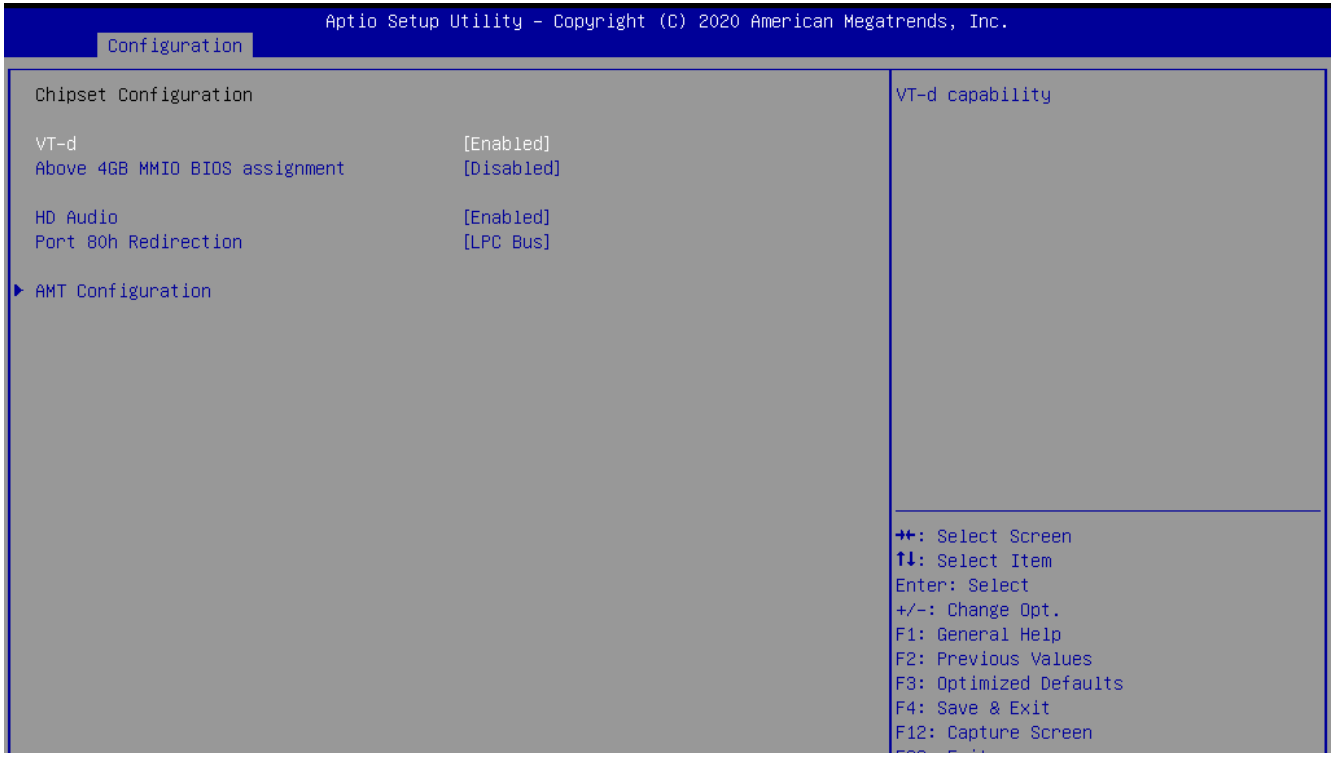
CPU Configuration Parameters



Feature	Description	Options
Active Processor Cores	Number of cores to enable in each processor package.	★All, 1
Hyper-Threading	Enable or Disable Hyper-Threading Technology	★Enabled ,Disabled
Boot performance mode	Select the performance state that the BIOS will set starting from reset vector	★Max Non-Turbo Performance, Max Battery, Turbo Performance
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)	★Disabled, Enabled
C states	Enable/disable CPU Power Management. Allows CPU to go to C states It's not 100% utilized	★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
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,

Chipset Configuration

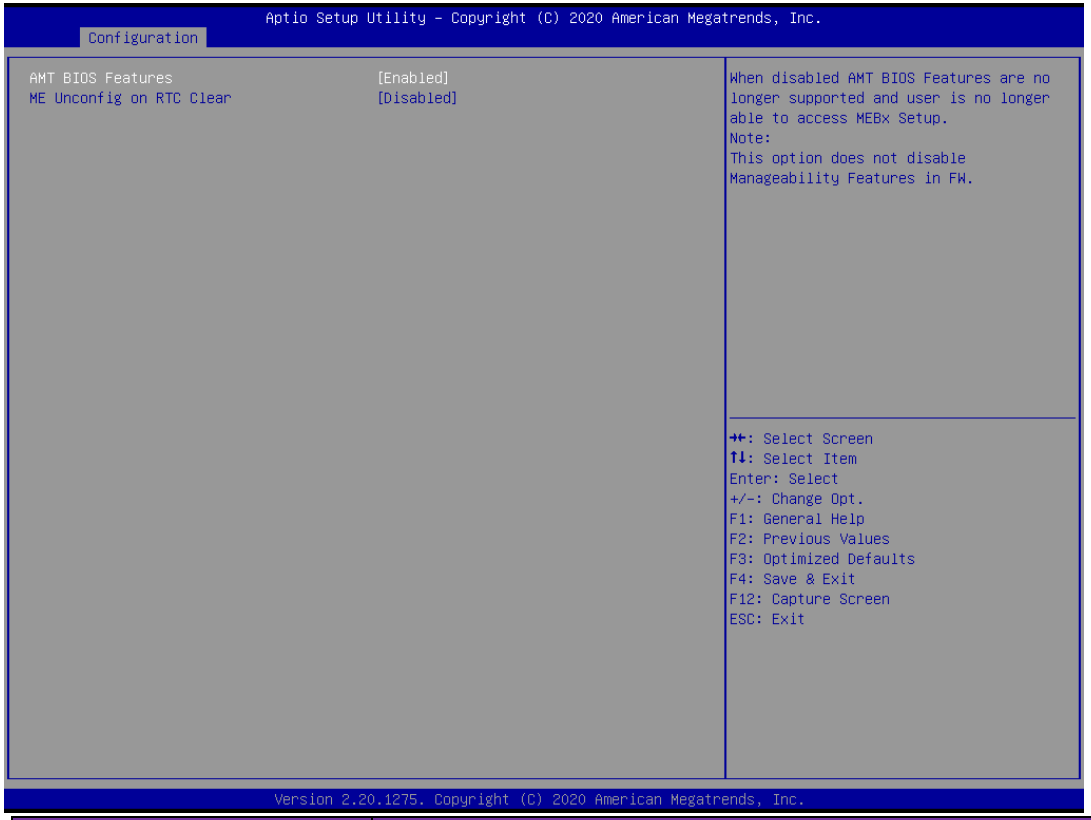
Configuration Chipset feature



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	★Enabled, Disabled
Port 80h Redirection	Control where the Port 80h cycles are sent	★LPC Bus, PCIE Bus

AMT Configuration

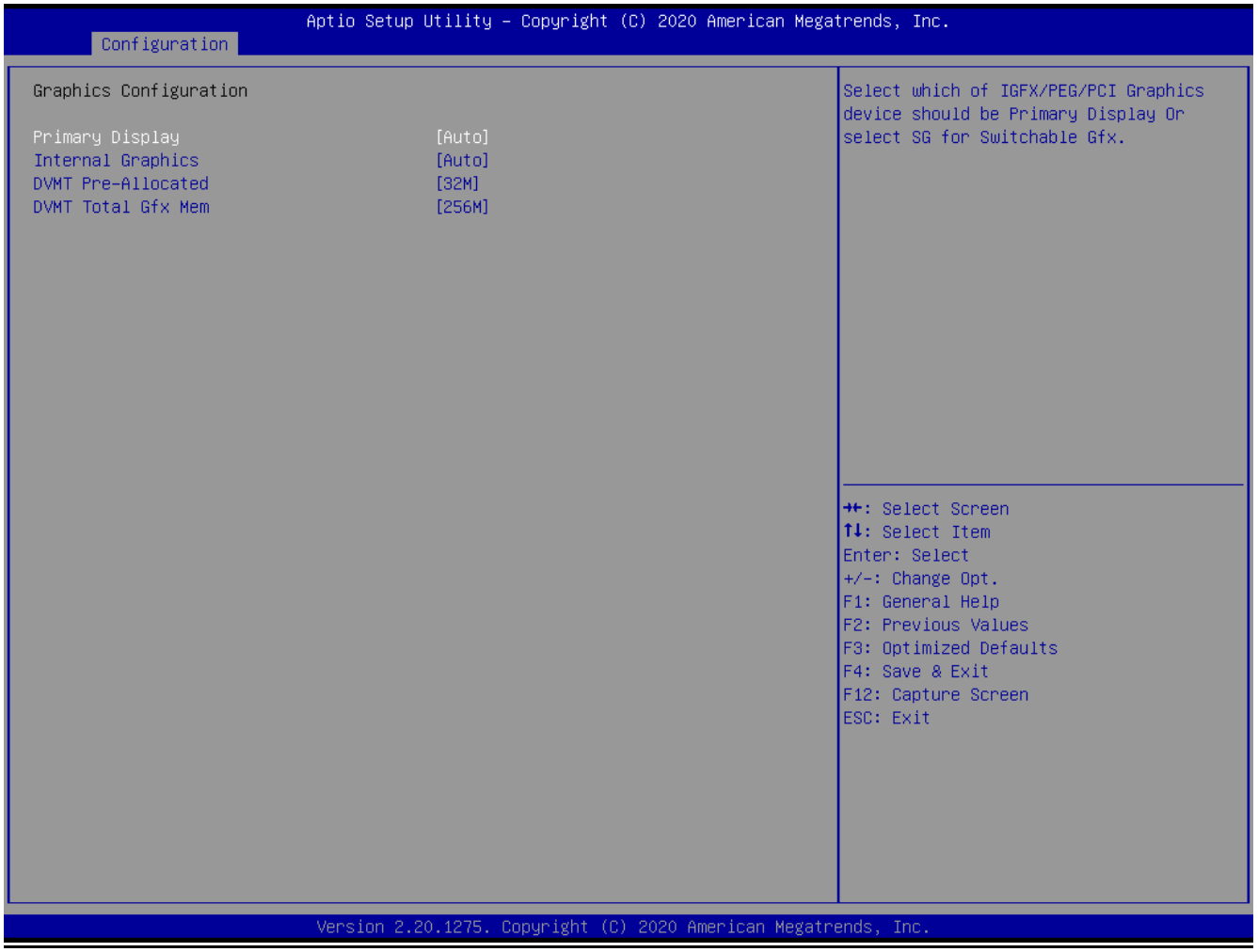
Configure Intel® Active Management Technology Parameters



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	★Enabled, Disabled
ME Unconfig on RTC Clear	When Disable ME will not be unconfigured on RTC Clear	★Disabled, Enabled

Graphics Configuration

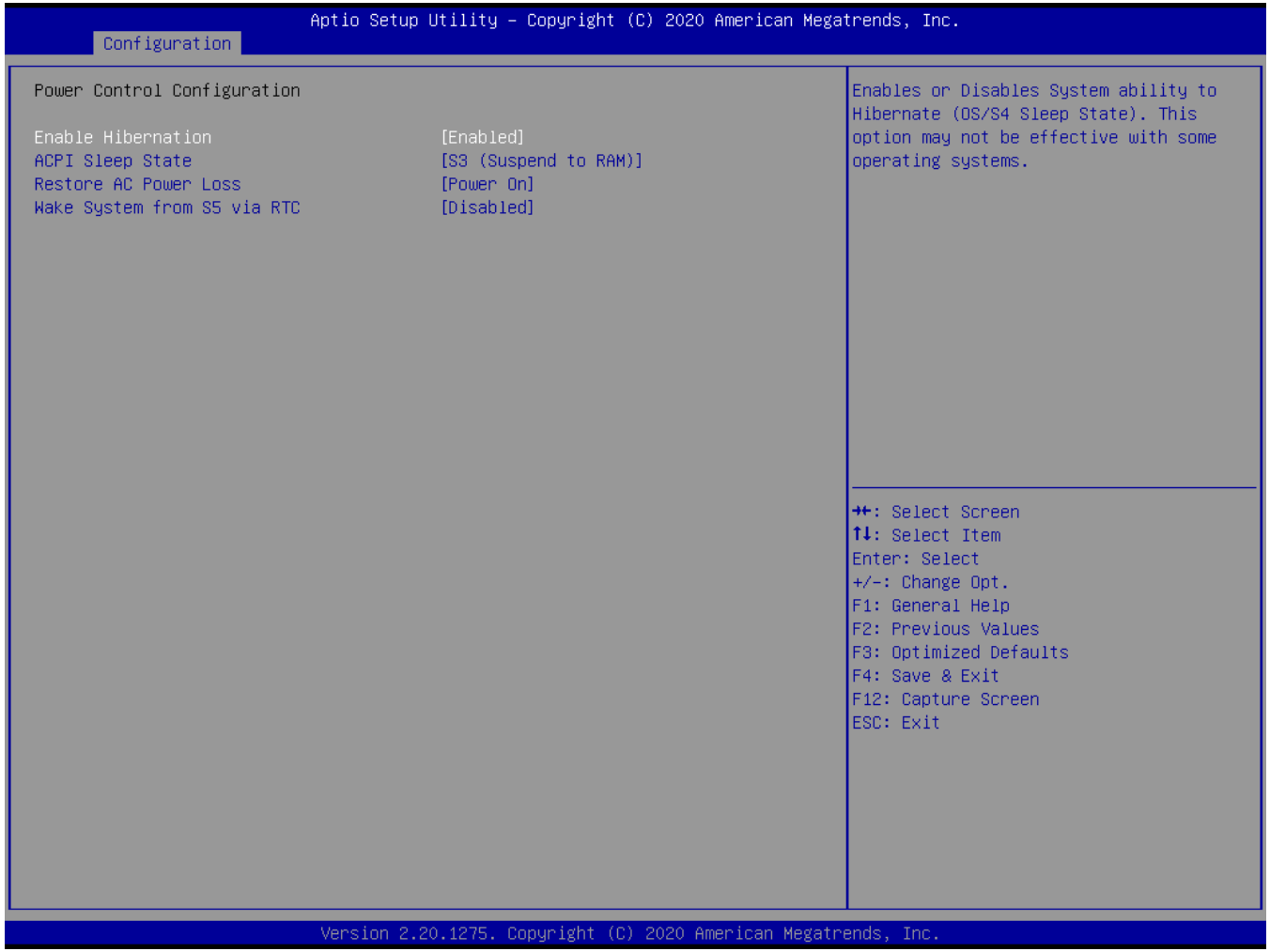
Configuration Graphics Settings



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, PCI
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

Power Control Configuration

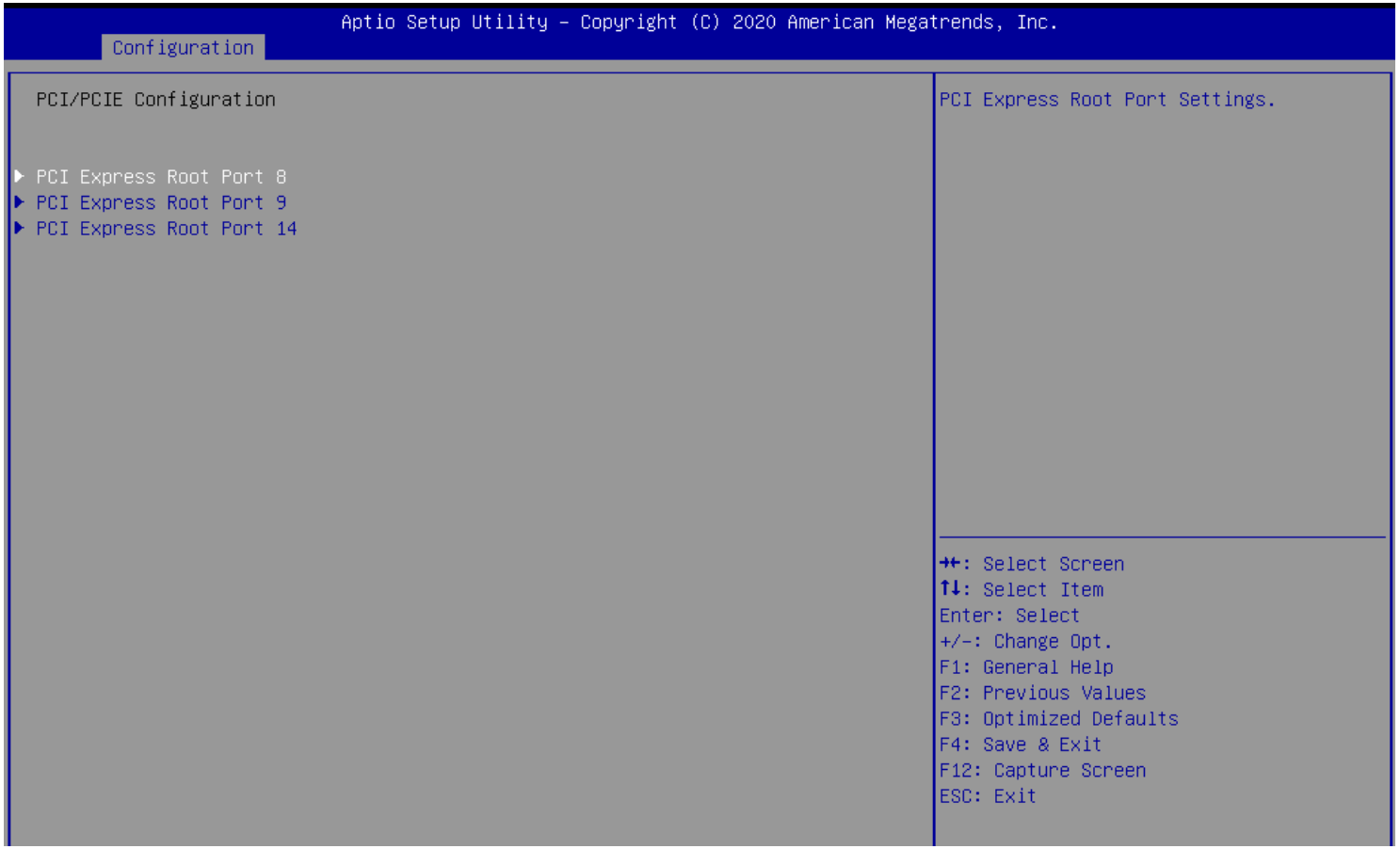
System Power Control Configuration Parameters



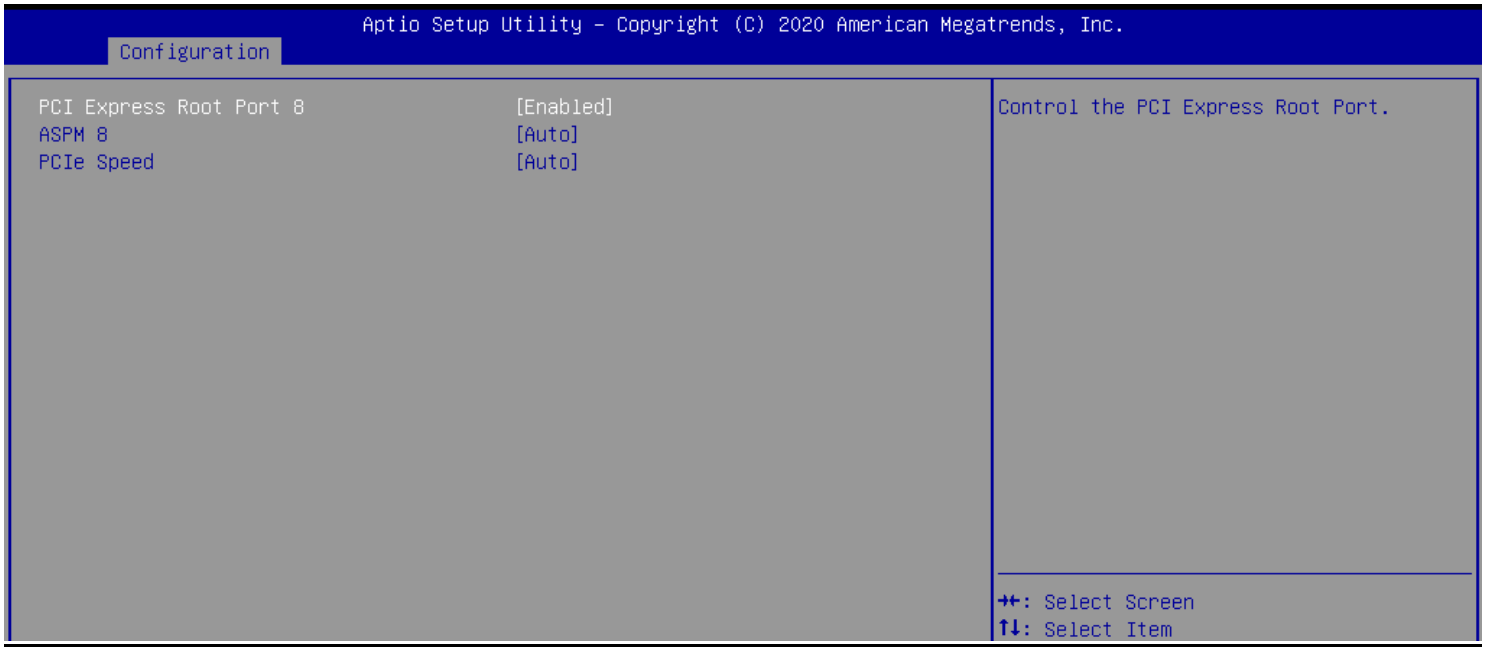
Feature	Description	Options
Enable Hibernation	Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some operating systems.	★Enabled , Disabled
ACPI Sleep State	Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed.	★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 On ,Power Off ,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

PCI/PCIE Configuration

PCI Express Root Port Settings.



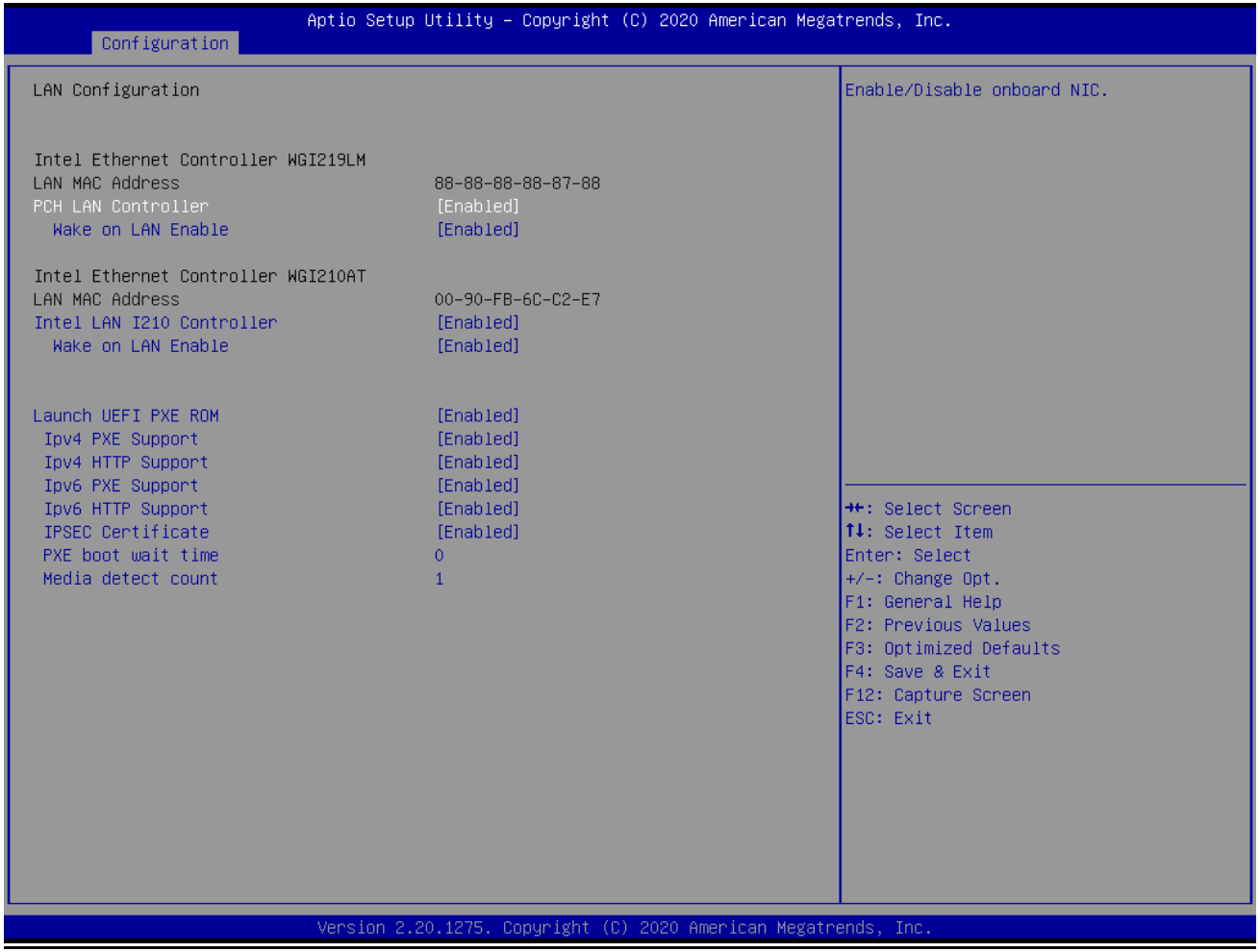
PCI Express Root Port8, Port9, Port14



Feature	Description	Options
PCI Express Root Port 8/9/14	Control the PCI Express Root Port.	★Enabled , Disabled
ASPM 8/9/14	Set the ASPM Level: Force L0s – Force all links to L0s State AUTO-BIOS auto configure DISABLE – Disables ASPM	★Auto ,Disabled, L0s, L1, L0sL1,
PCIe Speed	Configure PCIe Speed	★Auto, Gen1, Gen2, Gen3

LAN Configuration

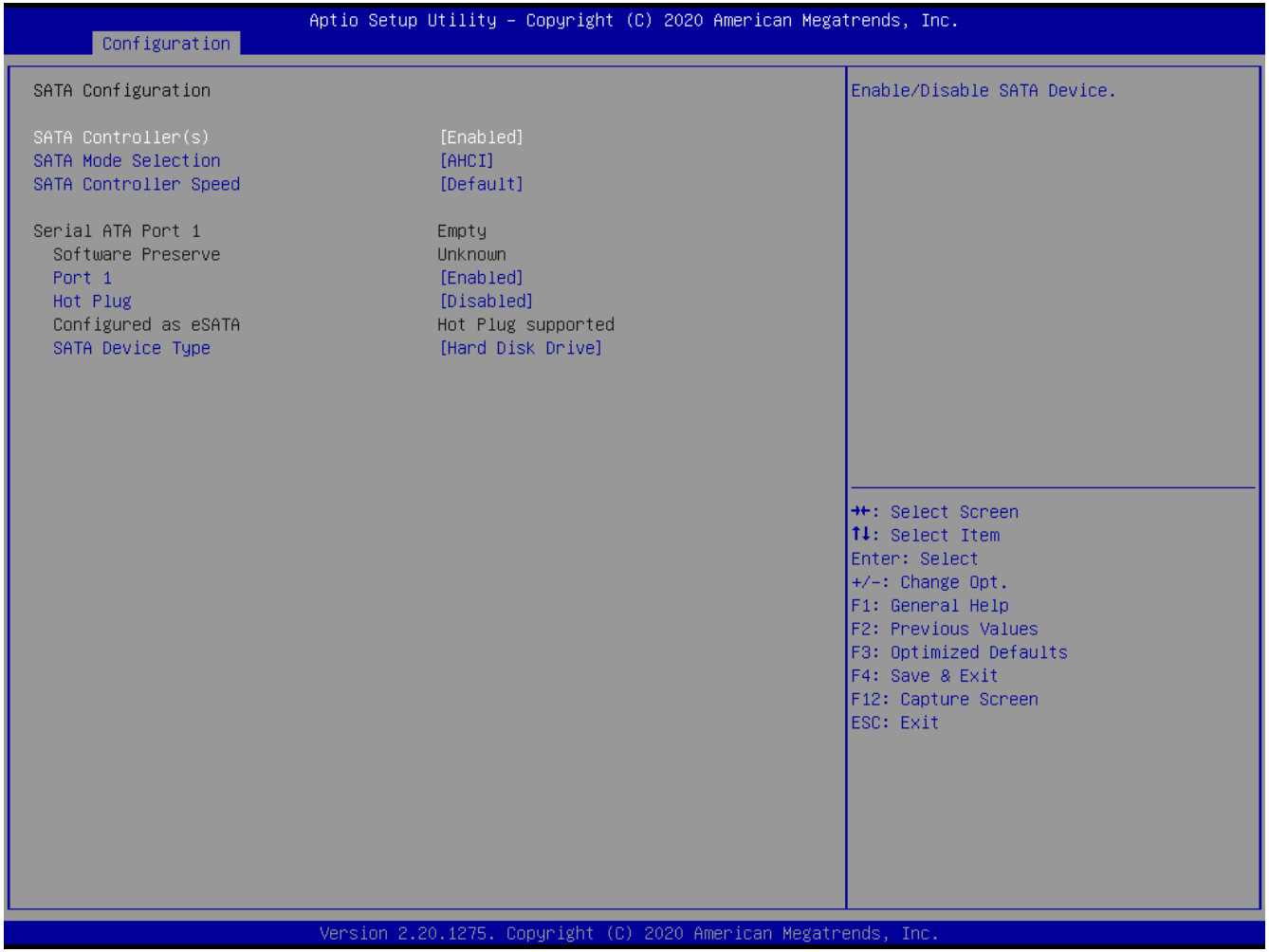
Configuration on Board LAN device.



Feature	Description	Options
PCH LAN Controller	Enable /Disable onboard NIC	★Enabled , Disabled
Wake on LAN	Enable/Disable integrated LAN to wake the system.	★Enabled , Disabled
Intel I210 LAN Controller	Enable or Disable Intel I210 LAN Controller#1.	★Enabled , Disabled
Wake on LAN	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 Support .If disable, IPv4 PXE boot support will not be available.	★Enabled , Disabled
Ipv4 HTTP Support	Enable /Disable Ipv4 HTTP Support. If disable, IPv4 HTTP boot support will not be available.	★Enabled , Disabled
Ipv6 PXE Support	Enable /Disable Ipv6 PXE Support .If disable, IPv6 PXE boot support will not be available.	★Enabled , Disabled
Ipv6 HTTP Support	Enable /Disable Ipv6 HTTP 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 value.	★0
Media detect count	Number of times the presence of media will be checked. Use either +/- or numeric keys to set value.	★1

SATA Configuration

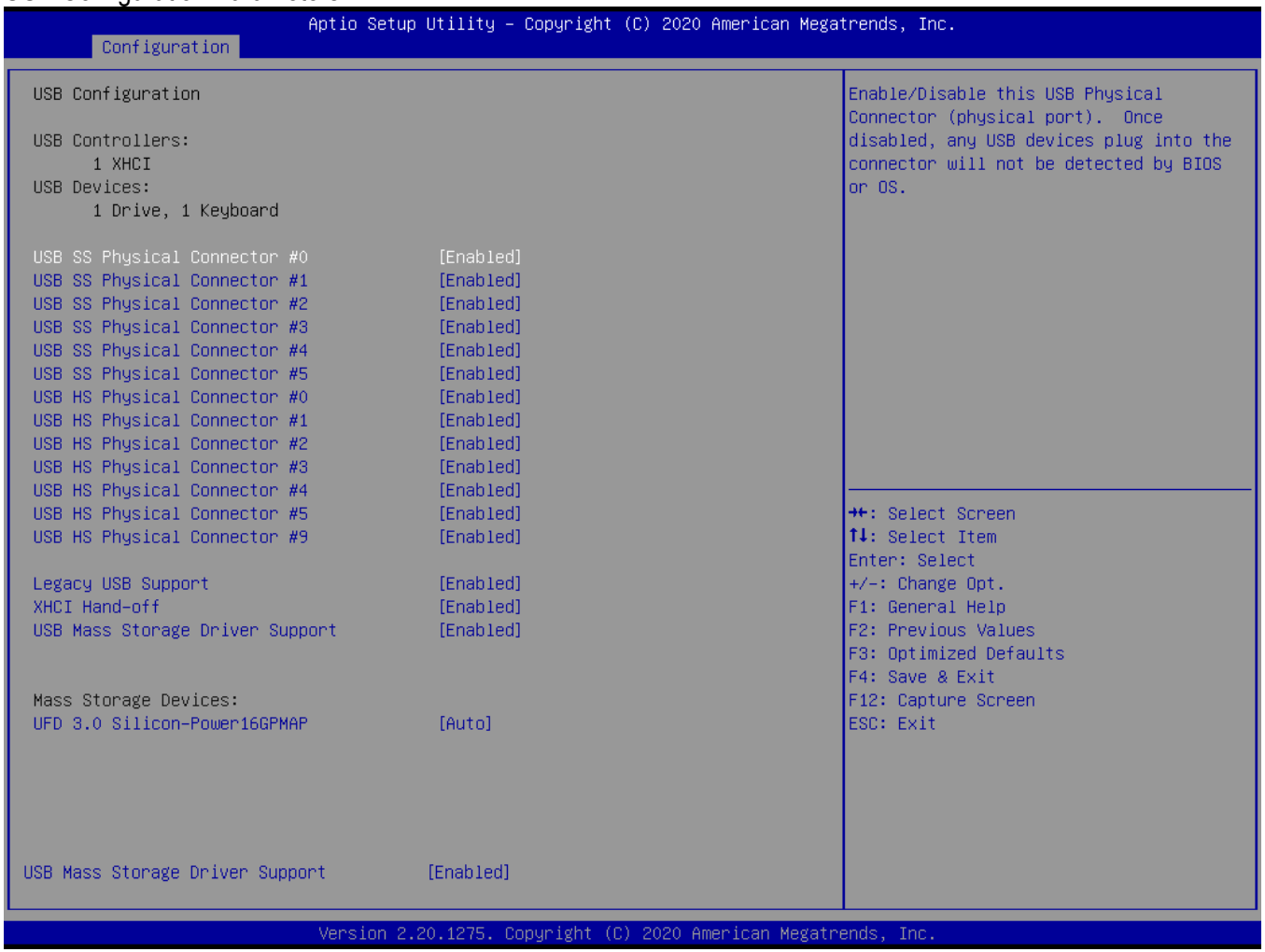
SATA Device Options Settings



Feature	Description	Options
SATA Controller(s)	Enable/Disable SATA Device.	★Enabled , Disabled
SATA Mode Selection	Determines how SATA controller(s) operate.	★AHCI
SATA Controller Speed	Indicates the maximum speed the SATA controller can support	★Default,Gen1,Gen2,Gen3
Serial ATA Port 1		
Port 1	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

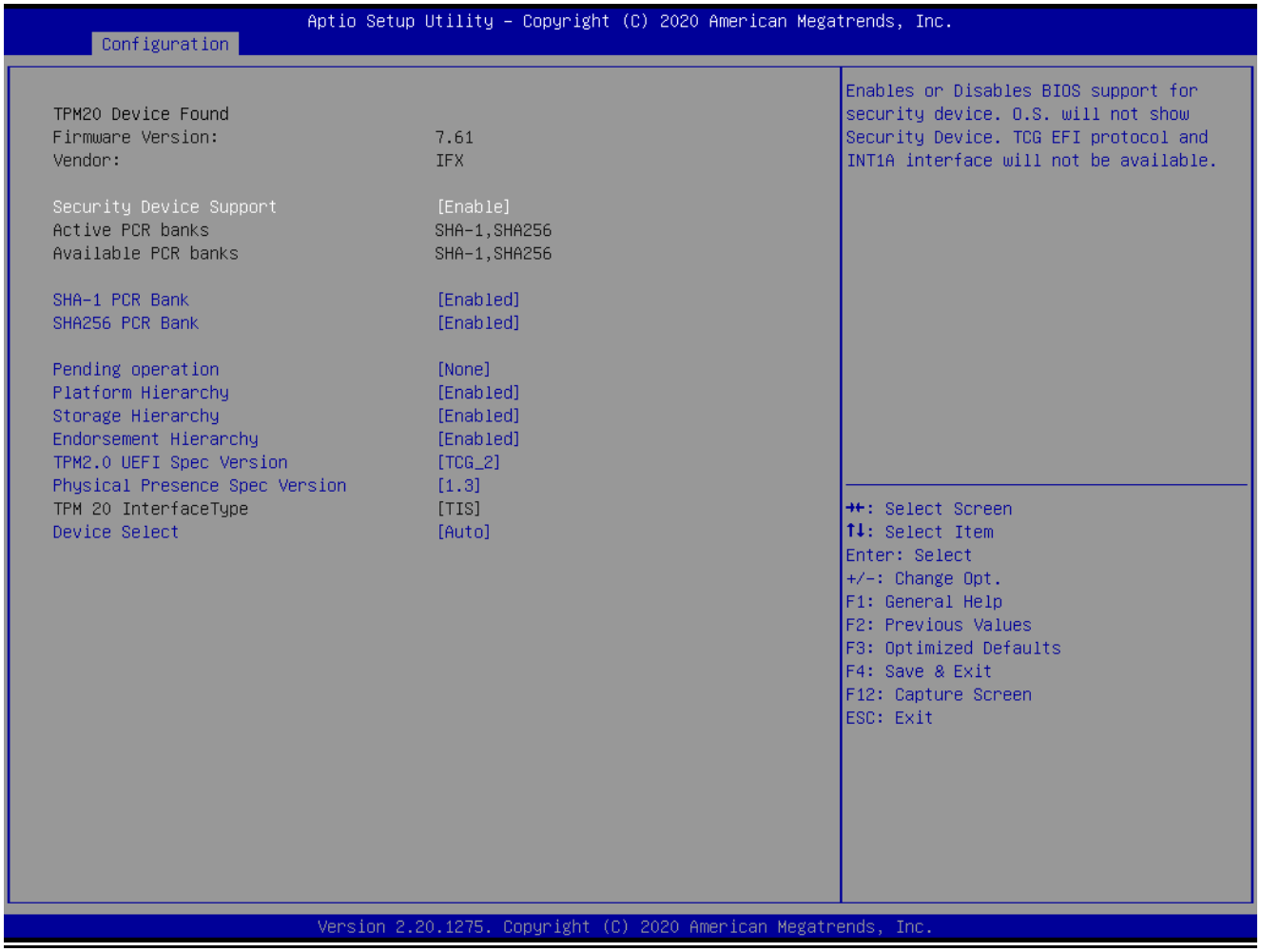
USB Configuration Parameters



Feature	Description	Options
USB SS/HS Physical Connector #0~5,#9	Enable/Disable this USB Physical Connector. 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 application	★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

TPM Configuration

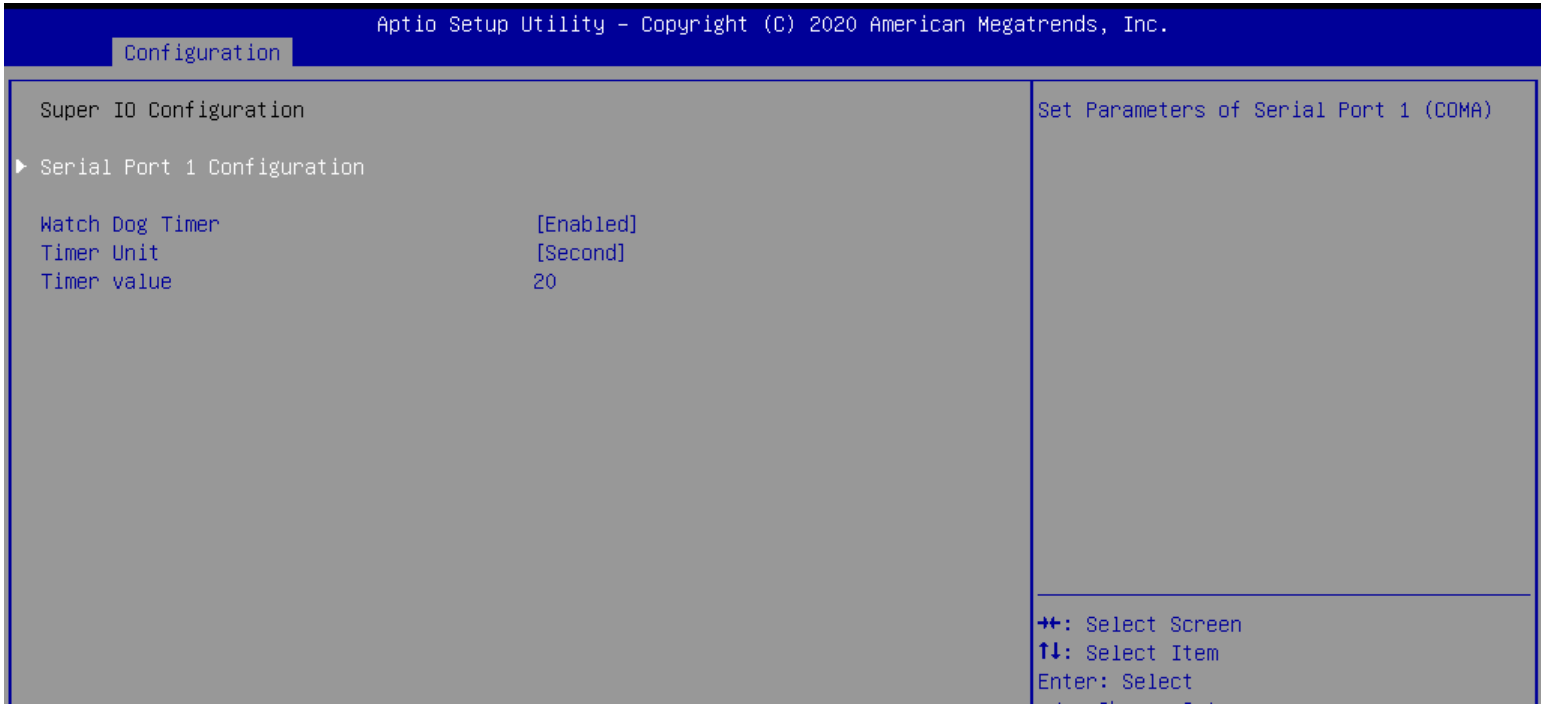
Trusted Computing Setting



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

Super IO Configuration

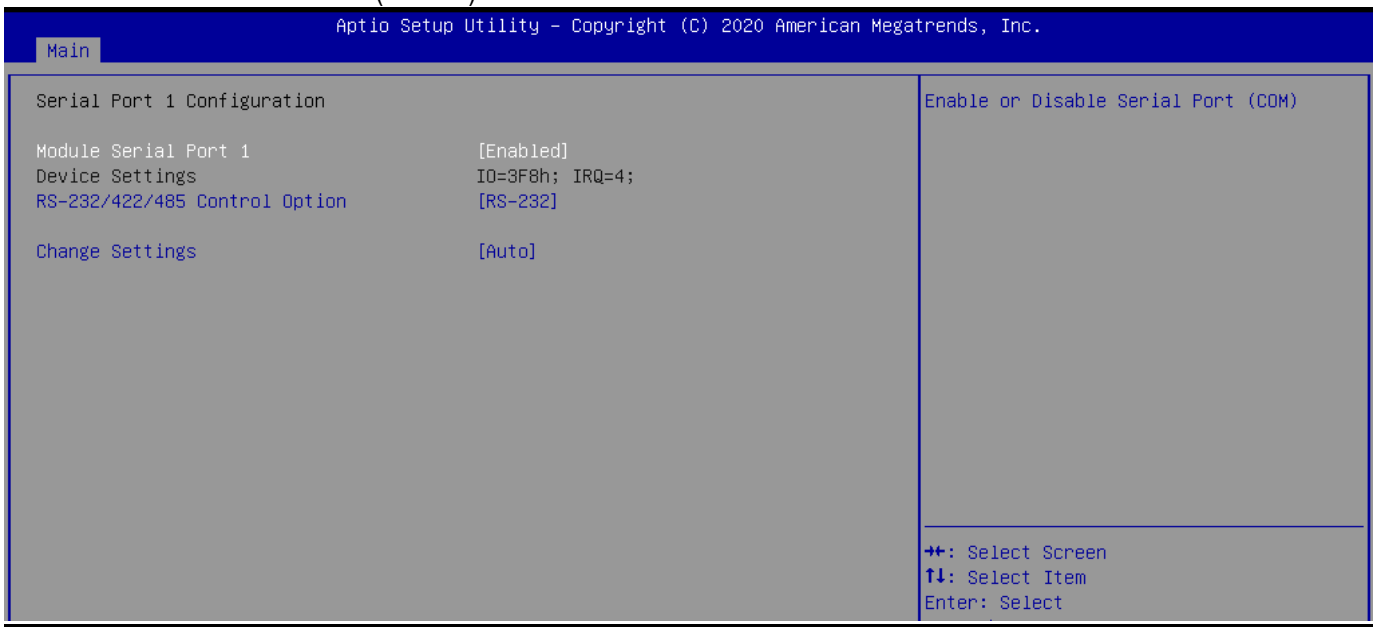
System Super IO Chip Parameters.



Feature	Description	Options
Watch Dog Timer	Enable/Disable Watch Dog Timer	★Disabled, Enabled
Timer Unit	Select Timer count unit of WDT	★Second, Minute
Timer value	Set WDT Timer value	★20

Serial Port 1 Configuration

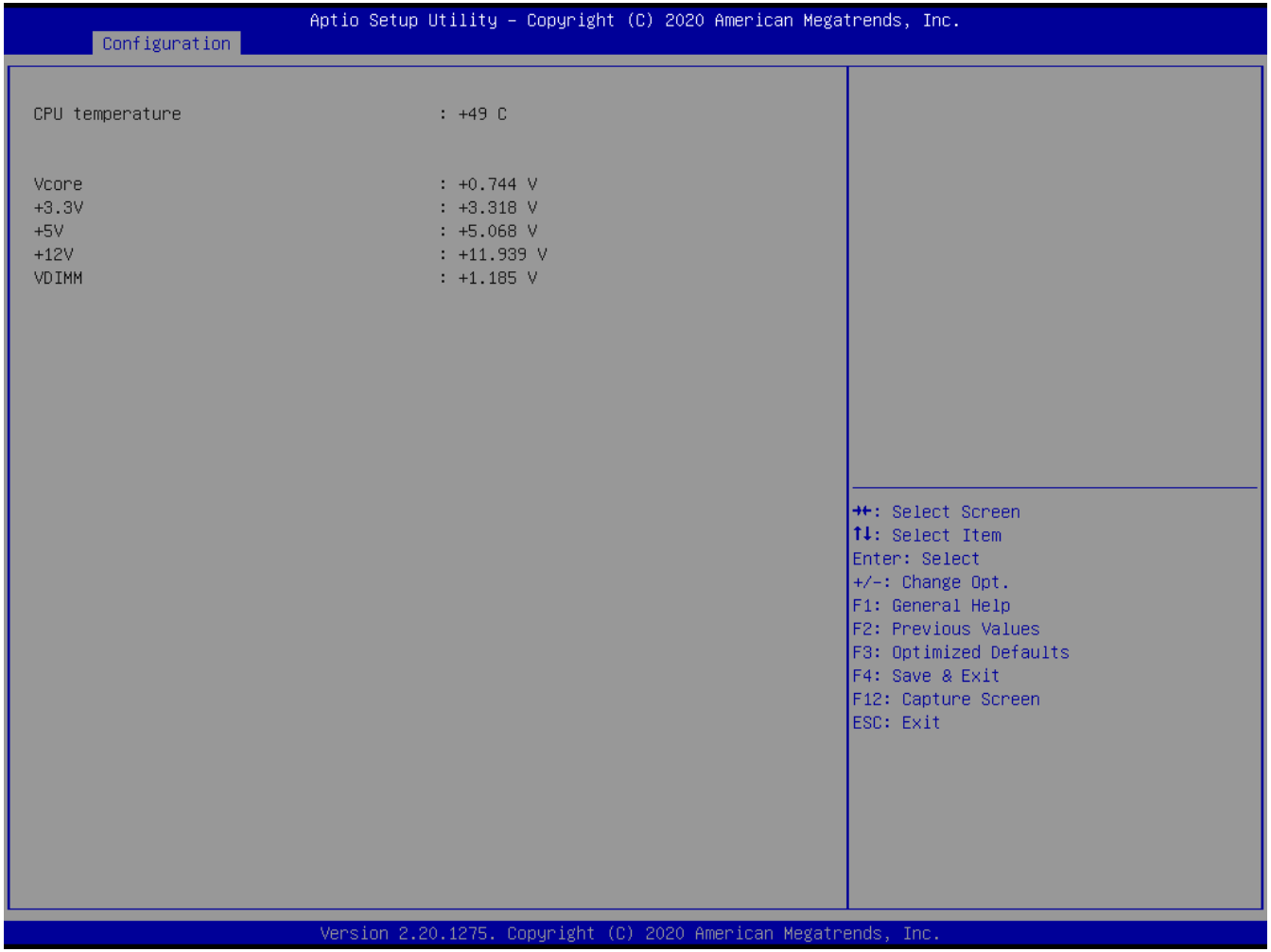
Set Parameters of Serial Port 1 (COM A)



Feature	Description	Options
Module Serial Port1	Enable or Disable Serial Port (COM)	★Enabled, Disabled
RS-232/422/485 Control Option	Serial Port RS-232/422/485 Control Option	★RS-232,RS-485 HALF DUPLEX,RS-422 FULL DUPLAX
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

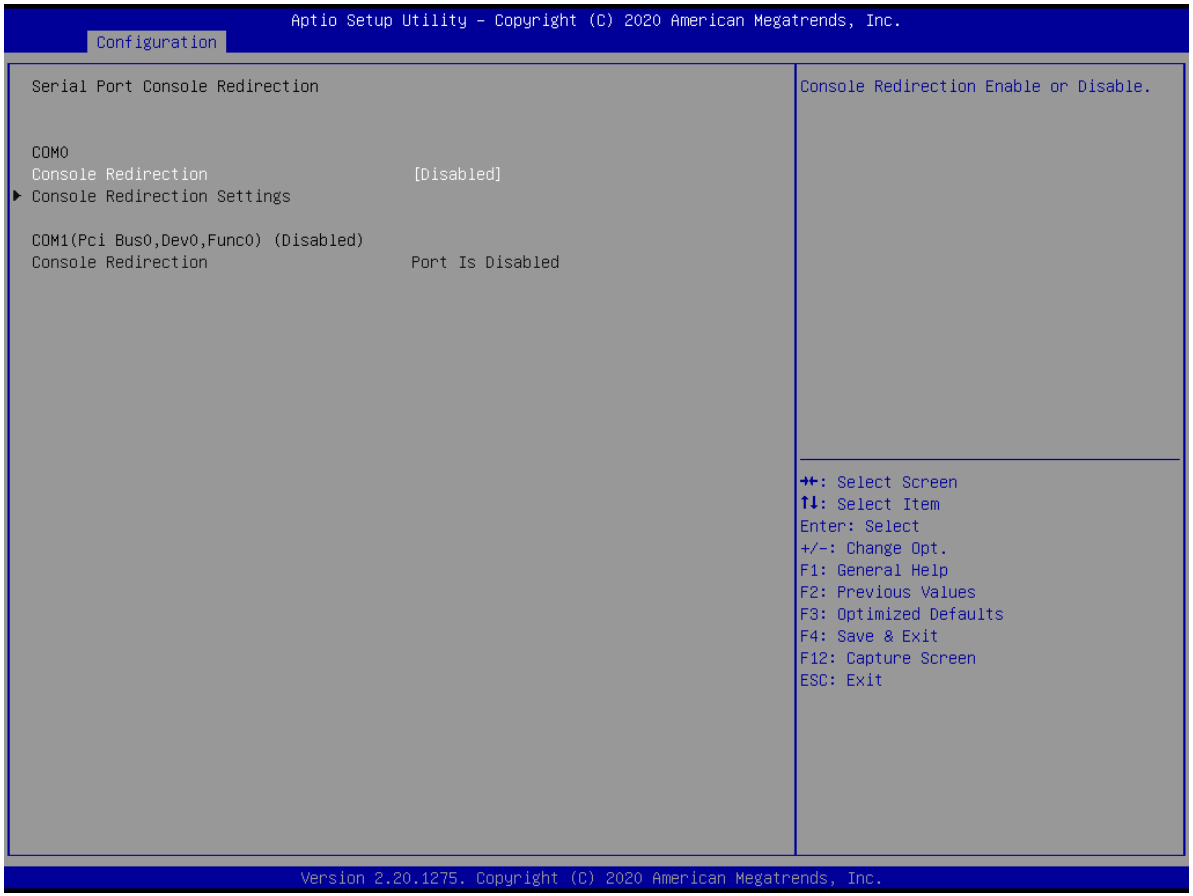
H/W Monitor

Monitor hardware status



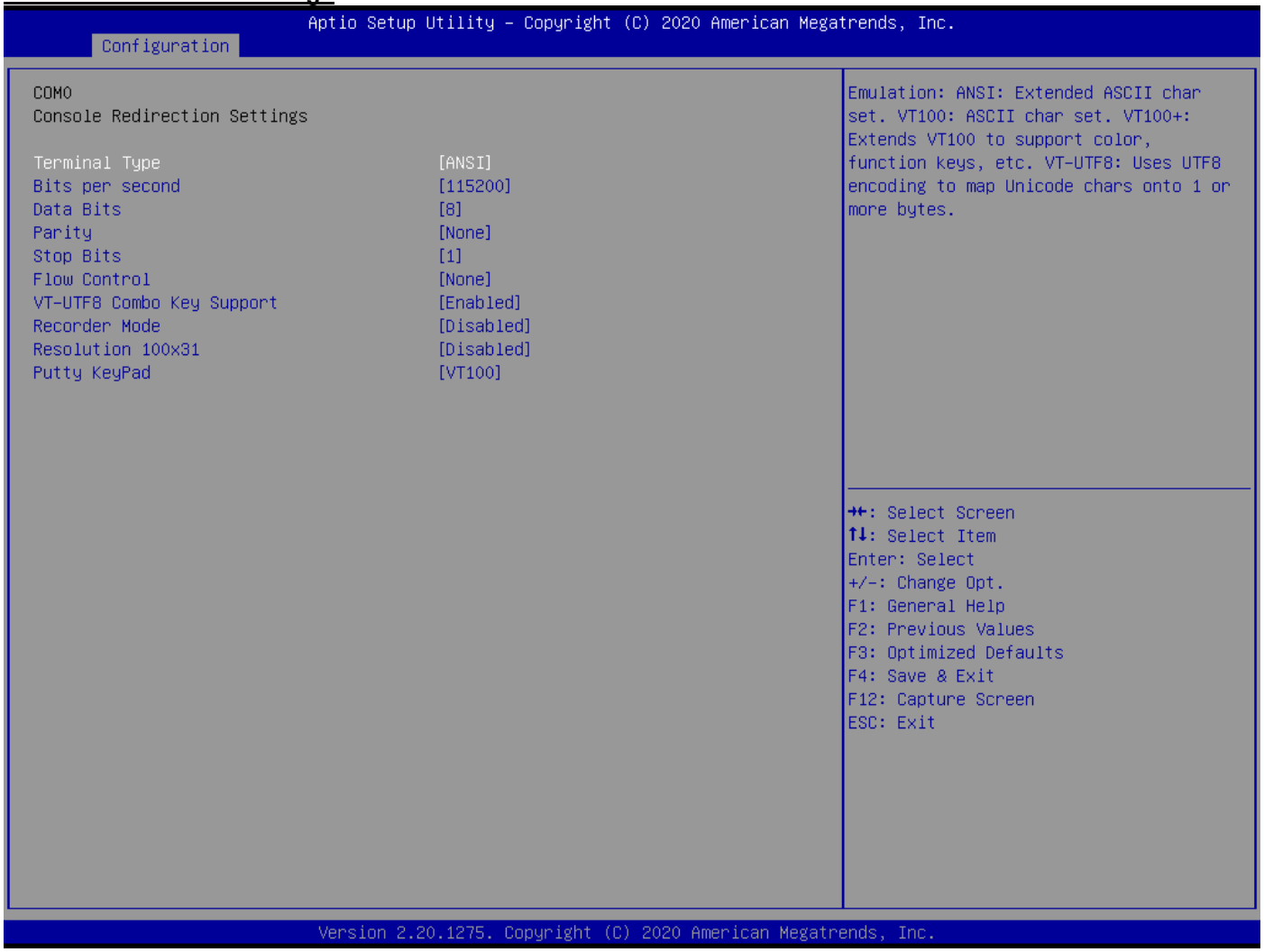
Serial Port Console Redirection

Serial Port Console Redirection



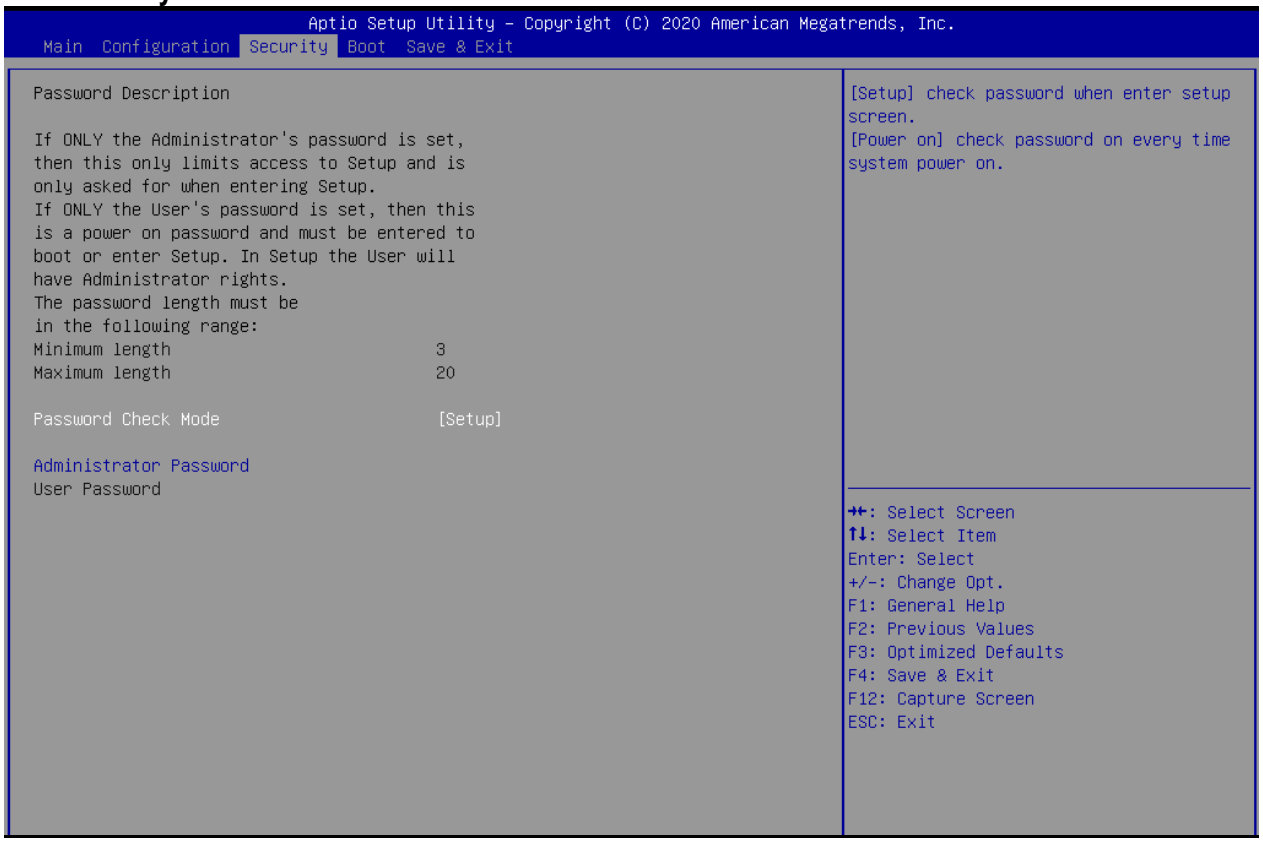
Feature	Description	Options
Console Redirection	Console Redirection Enable or Disable	★Disabled, Enabled

Console Redirection Settings



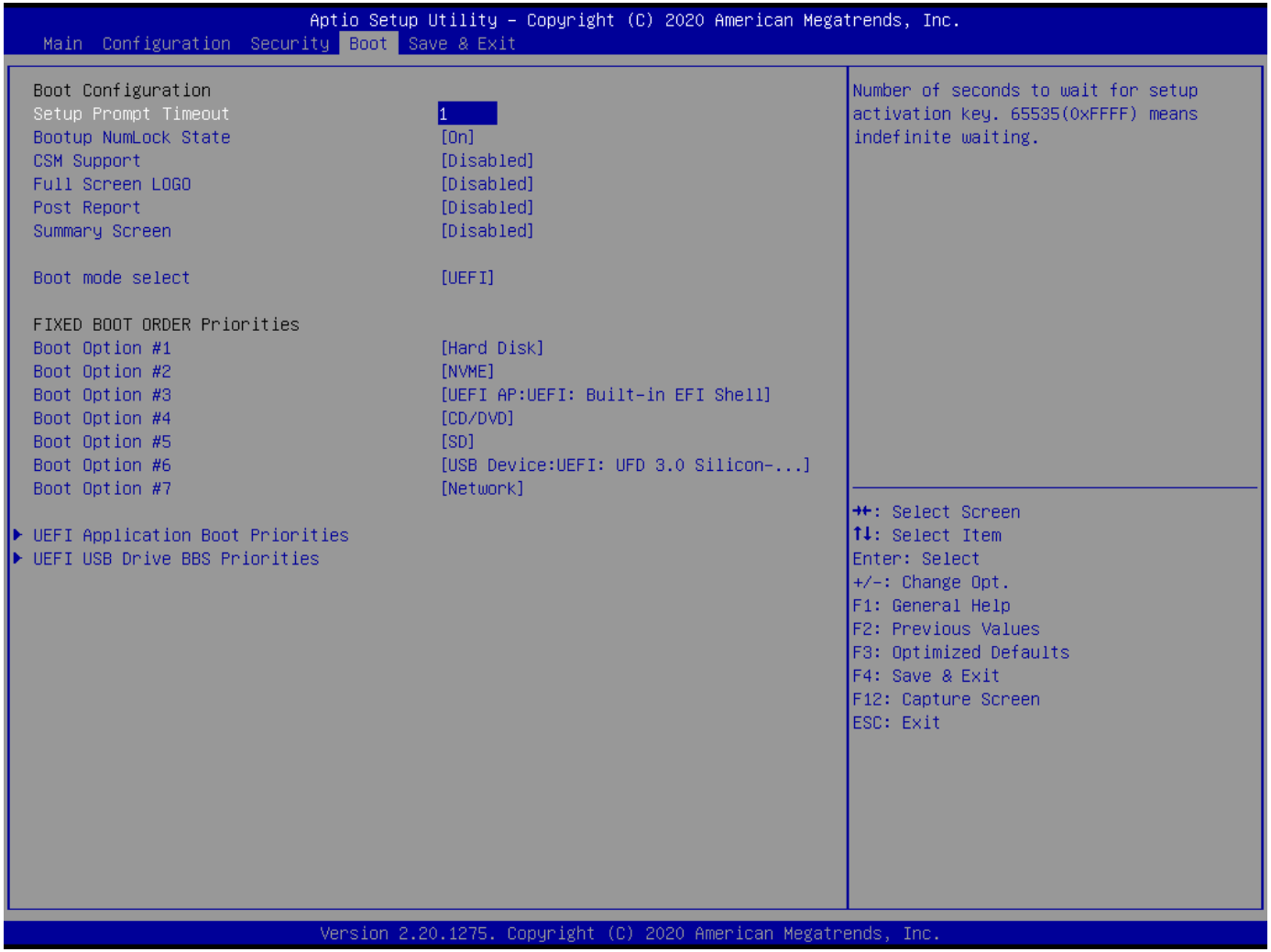
Feature	Description	Options
Terminal Type	Emulation: ANSI: Extended ASCII char set. VT100: ASCII char set. VT100+: Extends VT100 to support color, function keys, etc. VT-UTF8: Uses UTF8 encoding to map Unicode chars onto 1 or more bytes.	★ANSI, VT100, VT100+, VT-UTF8
Bits per second	Select Serial port 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 signal.	★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

7.2.3 Security



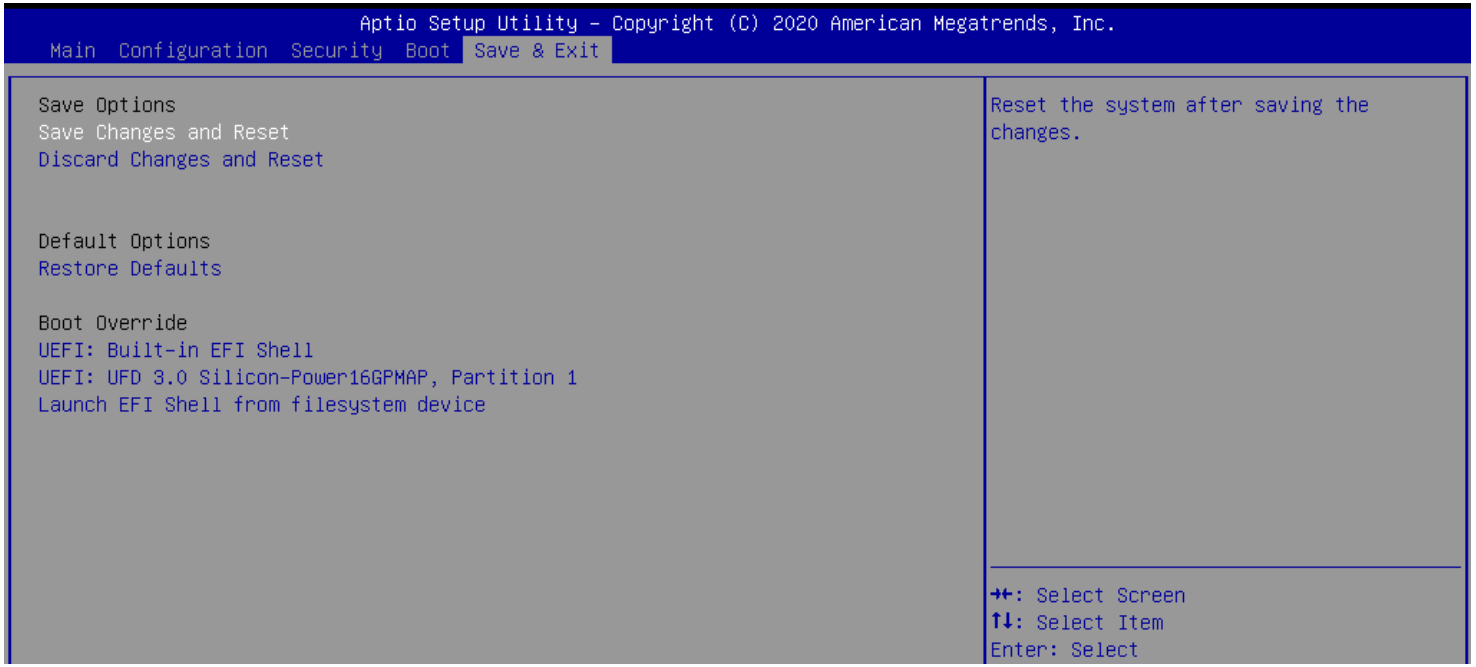
Feature	Description	Options
Password Check Mode	[Setup] check password when enter setup screen. [Power on] check password on every time system power on.	★Setup, Power on
Administrator Password	Set Administrator Password	

7.2.4 Boot


Aptio Setup Utility – Copyright (C) 2020 American Megatrends, Inc.
Main Configuration Security Boot Save & Exit
Boot Configuration
Setup Prompt Timeout 1
Bootup NumLock State [On]
CSM Support [Disabled]
Full Screen LOGO [Disabled]
Post Report [Disabled]
Summary Screen [Disabled]
Boot mode select [UEFI]
FIXED BOOT ORDER Priorities
Boot Option #1 [Hard Disk]
Boot Option #2 [NVME]
Boot Option #3 [UEFI AP:UEFI: Built-in EFI Shell]
Boot Option #4 [CD/DVD]
Boot Option #5 [SD]
Boot Option #6 [USB Device:UEFI: UFD 3.0 Silicon-...]
Boot Option #7 [Network]
UEFI Application Boot Priorities
UEFI USB Drive BBS Priorities
Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.
→←: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
F12: Capture Screen
ESC: Exit
Version 2.20.1275. Copyright (C) 2020 American Megatrends, Inc.

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. Note: if you want to disable CSM support, you should set the video UEFI.	★Disabled, Enabled
CSM Support[Enable]		
Network	Controls the execution of UEFI and Legacy Network 0pROM	★UEFI, Do not launch, Legacy
Storage	Controls the execution of UEFI and Legacy Storage 0pROM	★UEFI, Do not launch, Legacy
Video	Controls the execution of UEFI and Legacy Video 0pROM	★UEFI, Do not launch, Legacy
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	★UEFI ,Legacy
Boot Option #1~7	Sets the system boot order	★Hard Disk, NVME, UEFI AP, CD/DVD,SD,USB Device, Network, Disabled
UEFI Application Boot Priorities	Specifies the Boot Device Priority sequence from available UEFI Application	

7.2.5 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		
Launch EFI Shell from filesystem device	Attempts to Launch EFI Shell application (Shell.efi) from one of the available filesystem devices.	

8 Troubleshooting

This section provides a few useful tips to quickly get NANO-6051 running with success. This section will primarily focus on system integration issues, in terms of BIOS setting, and OS diagnostics.

8.1 Hardware Quick Installation

ATX Power Setting

Unlike other Single board computer, NANO-6051 supports ATX 12V 4 Pin or DC 12V Power adaptor only. Therefore, there is no other setting that needs to be setup. However, there is ATX 4 Pin Connector – J9& DC JACK – J1 on the NANO-6051 board.

ATX 4 Pin Connector – J9

DC JACK – J1

8.2 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, 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 NANO-6051, 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.

8.3 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 JP6 on the NANO-6051 board 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.

JP6：Clear CMOS Setup

	Jumper Setting Description
*1-2	Normal
2-3	Clean CMOS

Question: How to update the BIOS file of NANO-6051?

Answer:

1. 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

2. Type in your User name and password and log in the download center.
3. Select "Search download" and type the keyword "NANO-6051.
4. Find the "BIOS" page and download the ROM file and flash utility.
5. 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 BIOS. NOTE: Once you use "update.efi" to update BIOS, it must be get into the SHELL MODE to update BIOS.
6. When you see the "FPT Operation Passed" message, which means the BIOS update processes finished. Please cut the AC power off and **wait for 10 seconds** before powering on.
7. 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.

9 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:	
Portwell, Inc.	E-mail: info@portwell.com.tw
Shanghai Portwell	E-mail: info@portwell.com.cn
Portwell Japan, Inc	E-mail: info@portwell.co.jp
American Portwell Technology	E-mail: info@portwell.com
European Portwell Technology	E-mail: info@portwell.eu
Portwell UK Ltd.	E-mail: info@portwell.co.uk
Portwell Deutschland GmbH	E-mail: info@portwell.eu
Portwell India Technology	E-mail: info@portwell.in
Portwell Korea, Inc.	E-mail: info@portwell.co.kr
Portwell Latin America	E-mail: vendas@portwell.com.br

10 Industry Specifications

10.1 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