

**COM Express™**  
**PCOM-BA02GL**  
**User's Guide** R0.1

## Revision History

Rev.	Note	Date
R0.1	Preliminary	2022 / 02 / 25

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# 1 Introduction

PCOM-BA02GL, a Type 10 Mini COM Express® (84 x 55 mm) module which based on Intel® Elkhart Lake Atom® x6000 and Pentium® J / N series processors. In this architecture, it could provide LVDS, and high quantity HDMI, eDP, DP with 4K resolution. And it also provides turbo mode up to 3.0GHz, with extending 4x PCIe 3.0 x1, 2x USB 3.2 Gen2, 8x USB 2.0, and 2x SATA III devices. With ultra low power consumption(4.5 to 12W), wide-temp support, it could provide very energy saving and high effective performance. Portwell want to promote PCOM-BA02GL as vertical solution to aim in the different versatile applications, such as automation, military, hospitality, transportation and so on.

## 1.1 PCOM-BA02GL SKU List

Series	PCOM-BA02GL					
Ordering P/N	AB1-3K47	AB1-3L76	AB1-3L79	AB1-3L78	AB1-3L77	AB1-3L75
<b>CPU Specifications</b>						
Processor	Atom® x6425E	Atom® x6413E	Atom® x6211E	Pentium® J6426	Celeron® N6211	Atom® x6425RE
# of Cores	4	4	2	4	2	4
# of Threads	4	4	2	4	2	4
Cache	1.5 MB	1.5 MB	1.5 MB	1.5 MB	1.5 MB	1.5 MB
Base Frequency	2.0 GHz	1.5 GHz	1.3 GHz	2.0 GHz	1.2 GHz	1.9 GHz
Turbo Frequency	3.0 GHz	3.0 GHz	3.0 GHz	3.0 GHz	3.0 GHz	N/A
TDP	12 W	9 W	6 W	10 W	6.5 W	12 W
<b>Memory Specifications</b>						
Capacity	8GB LPDDR4	8GB LPDDR4	4GB LPDDR4	8GB LPDDR4	4GB LPDDR4	8GB LPDDR4
Speed	3200 Mhz	3200 Mhz	3200 Mhz	3200 Mhz	3200 Mhz	4267 Mhz
ECC	In-Band ECC	In-Band ECC	In-Band ECC	N/A	N/A	In-Band ECC
<b>I/O Specifications</b>						
eMMC	32GB	16GB	16GB	32GB	16GB	16GB
PCIe	4x PCIe 3.0	4x PCIe 3.0	4x PCIe 3.0	4x PCIe 3.0	4x PCIe 3.0	4x PCIe 3.0
USB 3.2 Gen2 / 2.0	2x / 4x	2x / 4x	2x / 4x	2x / 4x	2x / 4x	2x / 4x
SATA	2x	2x	2x	2x	2x	2x
Ethernet	1x 2.5 GbE	1x 2.5 GbE	1x 2.5 GbE	1x 2.5 GbE	1x 2.5 GbE	1x 2.5 GbE (TSN/TCC)

Table 1 PCOM-BA02GL SKU

## 2 Block Diagram

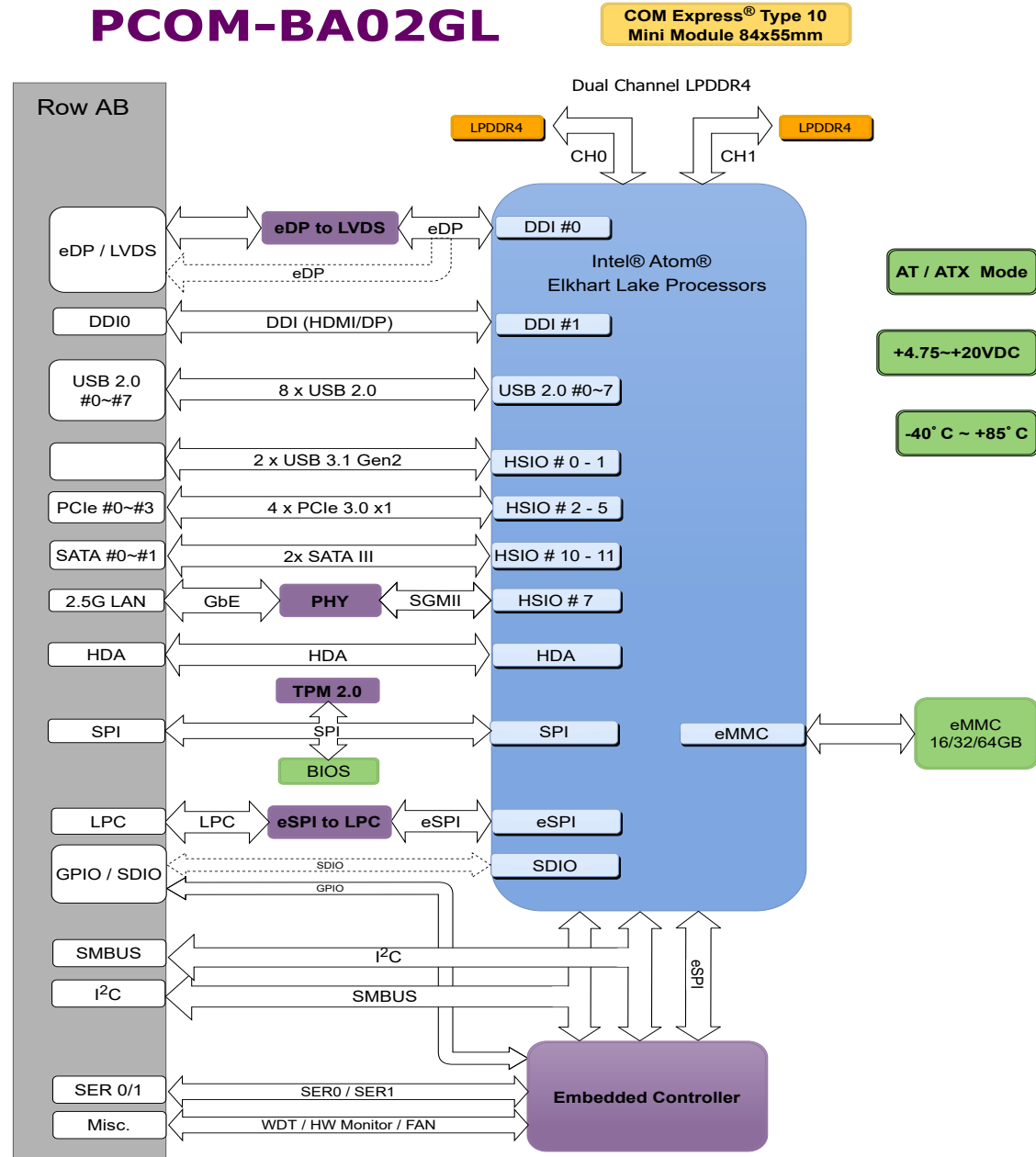


Figure 1 Block Diagram

### 3 Specifications

Product	➤ PCOM-BA02GL
Form Factor	➤ COM Express® Type 10, mini size (84 X 55mm)
Processor	<ul style="list-style-type: none"> <li>➤ Intel® Atom® x6425E</li> <li>➤ Intel® Atom® x6413E</li> <li>➤ Intel® Atom® x6211E</li> <li>➤ Intel® Pentium® J6426</li> <li>➤ Intel® Celeron® N6211</li> <li>➤ Intel® Atom® x6425RE</li> </ul>
BIOS	➤ AMI BIOS
Memory	<ul style="list-style-type: none"> <li>➤ Up to 8GB LPDDR4</li> <li>➤ Support in-band ECC on selected SKU</li> </ul>
Graphic Display interface	<ul style="list-style-type: none"> <li>➤ Intel® UHD Graphics (Gen11)</li> <li>➤ 1x DDI</li> <li>➤ 1x LVDS share with eDP</li> </ul>
Ethernet	<ul style="list-style-type: none"> <li>➤ 1x 2.5GbE (via GPY215 PHY)</li> <li>➤ Support TSN/TCC on selected SKU</li> </ul>
Audio	➤ HDA
PCI Express	➤ 4x PCIe 3.0
I/O	<ul style="list-style-type: none"> <li>➤ 2x USB 3.2 Gen2 / 2.0 + 2x USB 2.0</li> <li>➤ 2x SATA</li> <li>➤ 8 bit GPIO ( default 4 in / 4 out )</li> <li>➤ I2C / SMBus</li> <li>➤ 2x UART</li> </ul>

Hardware Monitors	➤ ITE series Embedded Controller, Voltage, Fan and Temperature
Security	➤ TPM 2.0 (Option)
Power Management	➤ ACPI 4.0
Environment	➤ Operating Temperature 0°C ~60°C Extended : -40°C ~+85°C (selected SKU) ➤ Storage Temperature -40°C ~+85°C ➤ Relative Humidity 5%~95%

Table 2 PCOM-BA02GL SPEC

## 3.1 Supported Operating Systems

The PCOM-BA02GL supports the following operating systems.

Vendor	Operating System	Distribution and Support
Microsoft	Windows 10 IoT Enterprise x64 (RS5)	Intel & Microsoft
Linux	Yocto Project (64-bit) Kernel 5.4	Yocto Project and ISV Partners
	Ubuntu (64-bit)	Canonical
	Wind River Linux LTS distribution (64-bit)	Wind River
	Wind River VxWorks 7	Wind River

Table 3 OS Support list

Portwell does not endorse/validate/support any specific Linux distribution or entity mentioned on this list.

Portwell recommends customers to work with Linux vendors/open source communities to find feature list and support model.

## 3.2 Windows OS Driver

Please download the drivers from Portwell download center website [http://www.portwell.tw/support/download\\_center.php](http://www.portwell.tw/support/download_center.php)

### 3.3 Electrical Characteristics

Input voltage	+12V $\pm$ 5%
RTC Battery	From Carrier
Power on mode	ATX Mode & AT Mode

Table 4 Electrical characteristics

#### *Power Distribution*

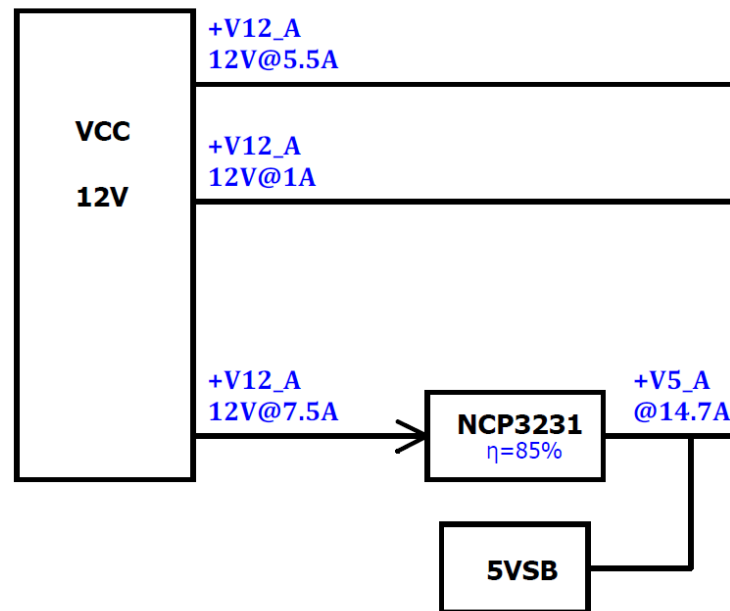


Figure 2 PCOM-BA02GL Power on sequence



● ATX Power Sequence

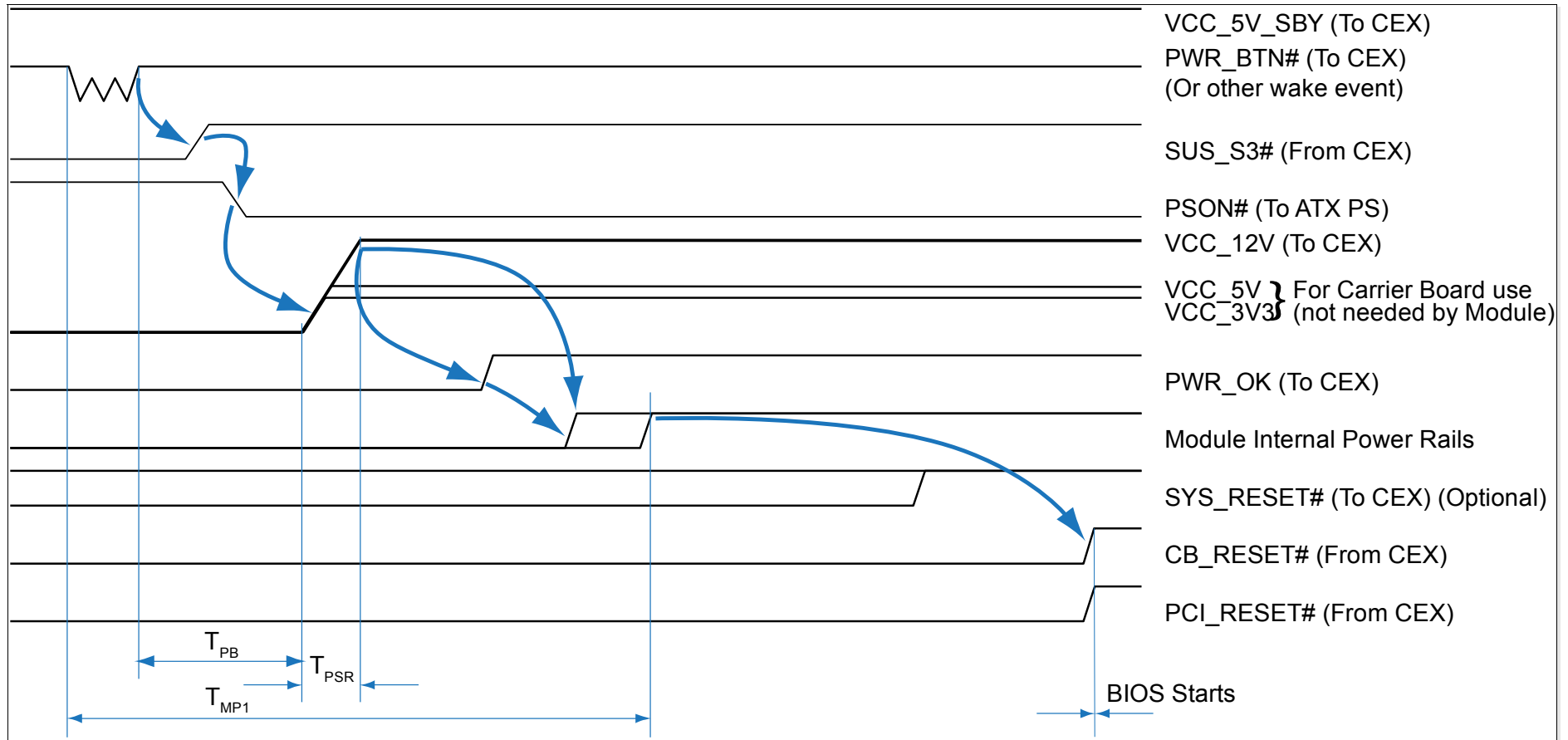


Figure 3 ATX style boot  
 (Reference from COM Express® Carrier Design Guide)

● AT Power Sequence

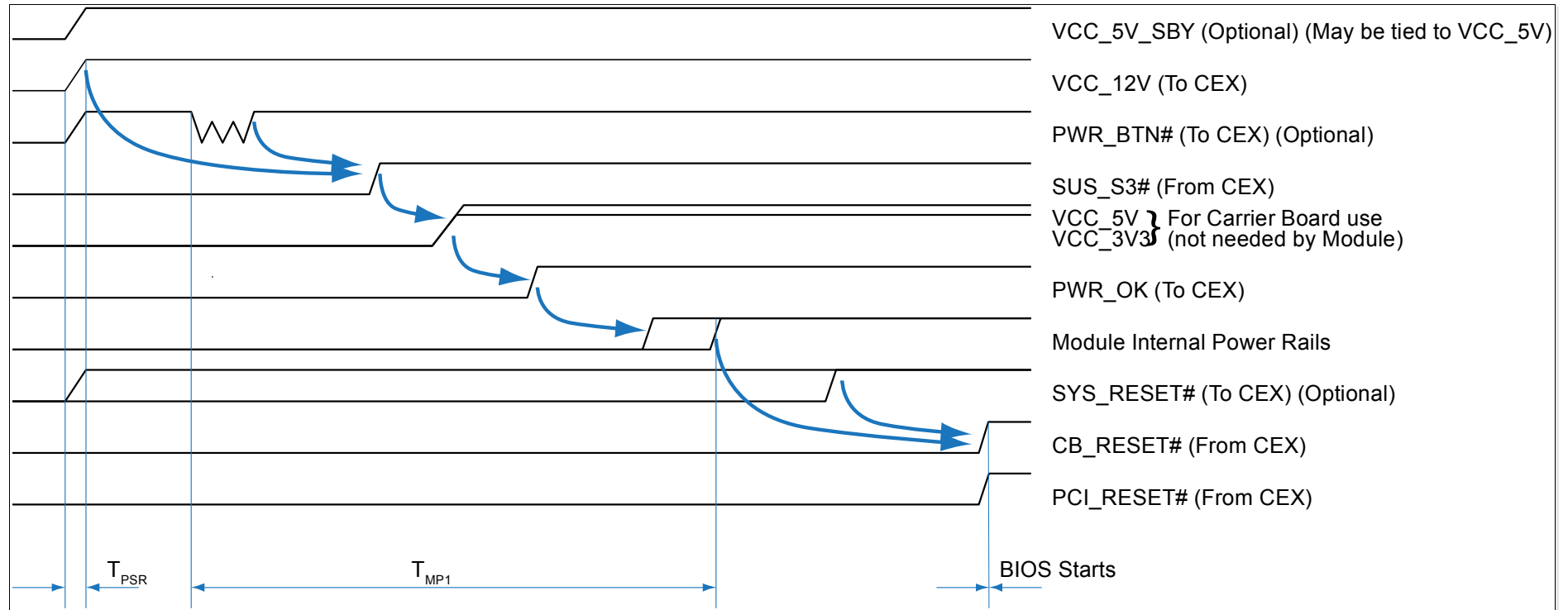


Figure 4 AT style boot  
 (Reference from COM Express® Carrier Design Guide)

- PWR\_OK signal

Carrier board hardware must keep this signal low until all power rails and clocks are stable. Releasing PWR\_OK too early or not driving it low at all may cause boot up abnormal symptom. It is a good design implementation to delay the PWR\_OK signal a little (at least 100ms) after all carrier board power rails are up, to ensure a stable system.

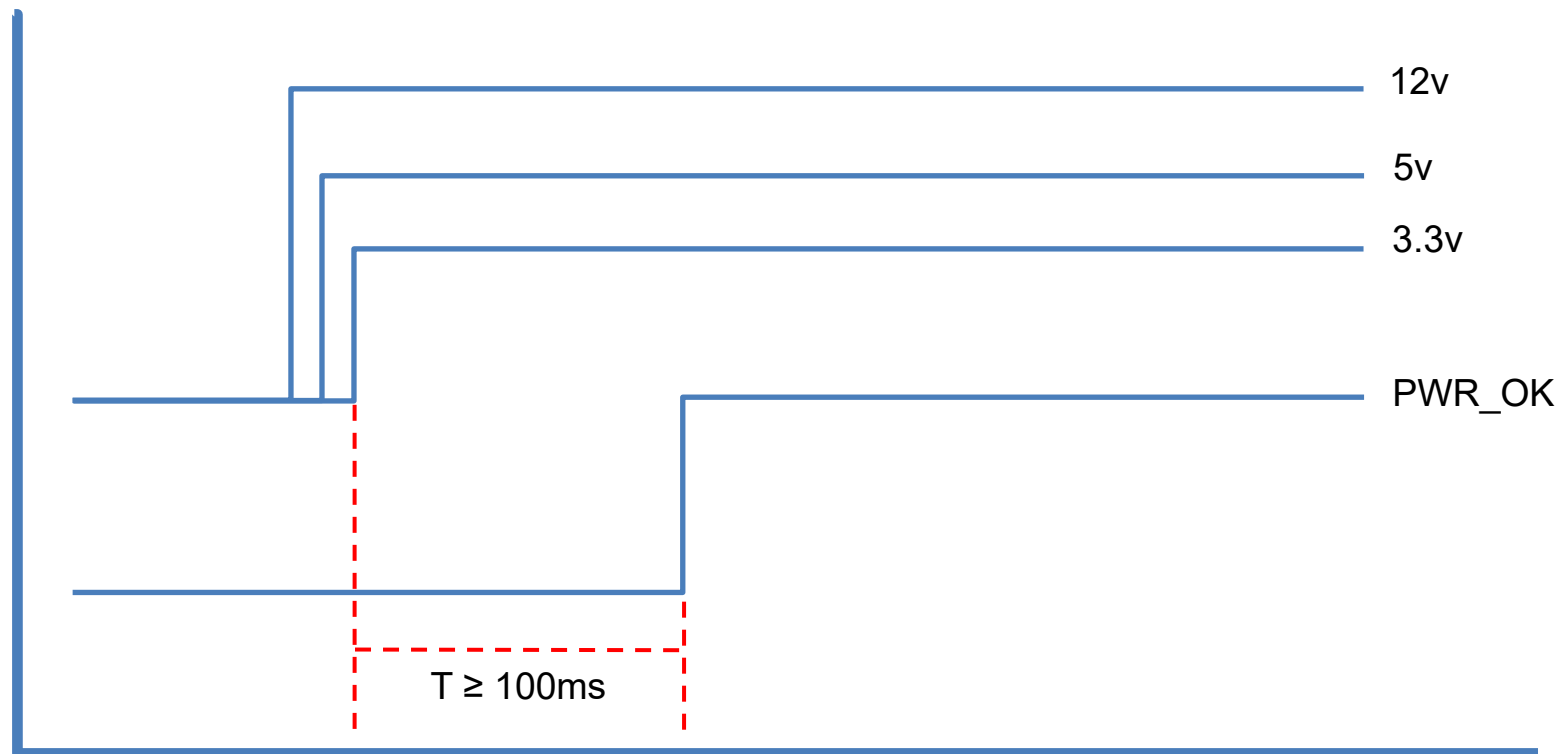


Figure 5 PWR\_OK signal brief diagram

## 3.4 Power Consumption

Series	PCOM-BA02GL					
Ordering P/N	AB1-3K47	AB1-3L76	AB1-3L79	AB1-3L78	AB1-3L77	AB1-3L75
Processor	Atom® x6425E	Atom® x6413E	Atom® x6211E	Pentium® J6426	Celeron® N6211	Atom® x6425RE
<b>Power Consumption</b>						
S0 Idle	TBD	TBD	TBD	TBD	TBD	TBD
100% workload without turbo mode	TBD	TBD	TBD	TBD	TBD	TBD
100% Workload with turbo mode	TBD	TBD	TBD	TBD	TBD	TBD
Peak Current	TBD	TBD	TBD	TBD	TBD	TBD
S3	TBD	TBD	TBD	TBD	TBD	TBD

Table 5 PCOM-BA02GL Power Consumption

### 3.5 Mechanical Dimensions

- Top / Bottom Side Dimension

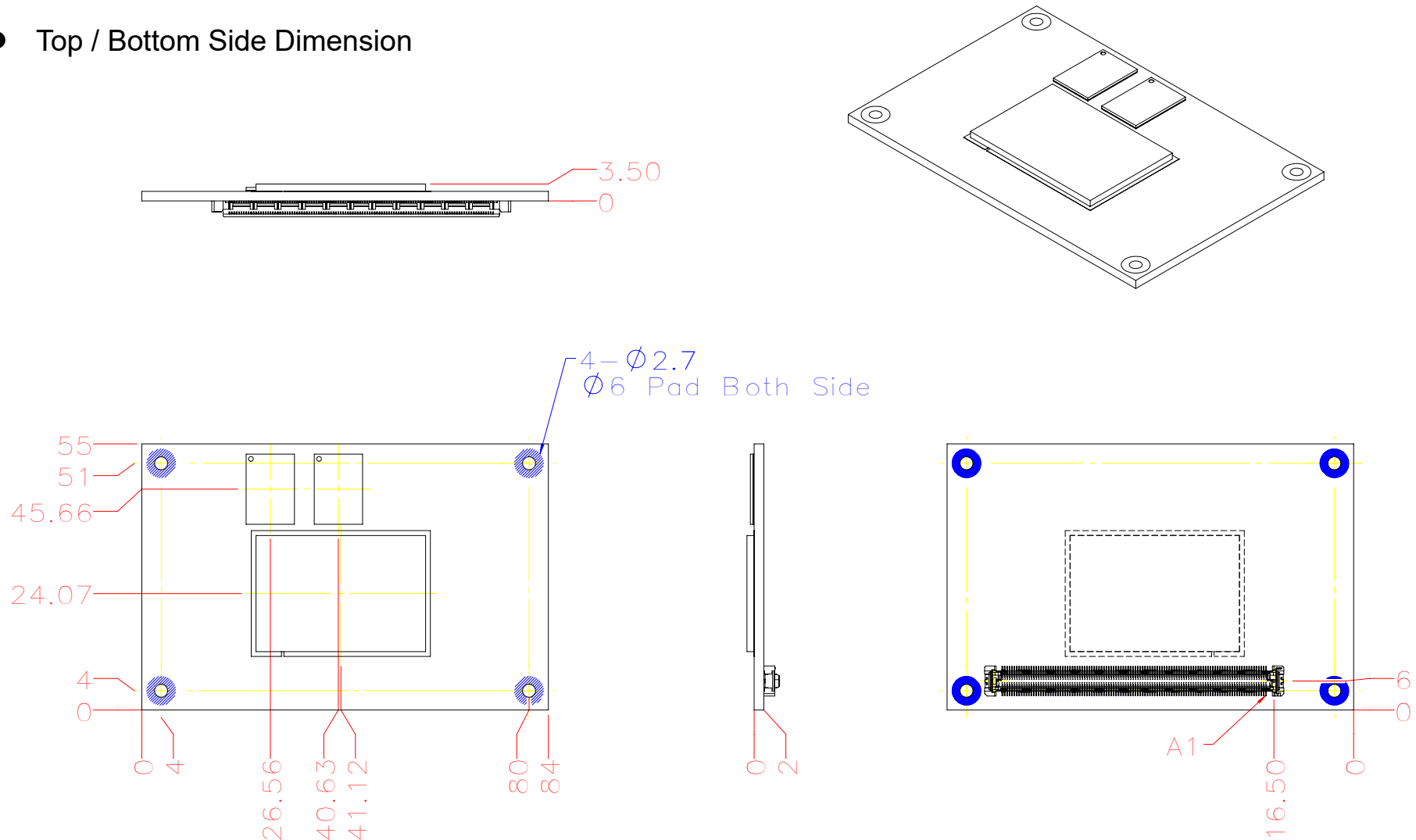


Figure 6 Mechanical Dimension - Top / Bottom

## 3.6 Environmental Specifications

Storage Temperature	-40°C ~ 85°C
Operation Temperature	0°C ~ 60°C Extended : -40°C ~ 85°C (Selected SKU)
Storage Humidity	5% ~ 95%
Operation Humidity	5% ~ 95%

Table 6 Environmental Specifications

## 3.7 Ordering Guide

### ◆ Module

Product	Ordering P/N
PCOM-BA02GL-x6425E-8G-32G	AB1-3K47
PCOM-BA02GL-x6413E-8G-16G	AB1-3L76
PCOM-BA02GL-x6211E-4G-16G	AB1-3L79
PCOM-BA02GL-J6426-8G-32G	AB1-3L78
PCOM-BA02GL-N6211-4G-16G	AB1-3L77
PCOM-BA02GL-x6425RE-8G-16G	AB1-3L75

Table 7 Ordering Guide - PCOM-BA02GL

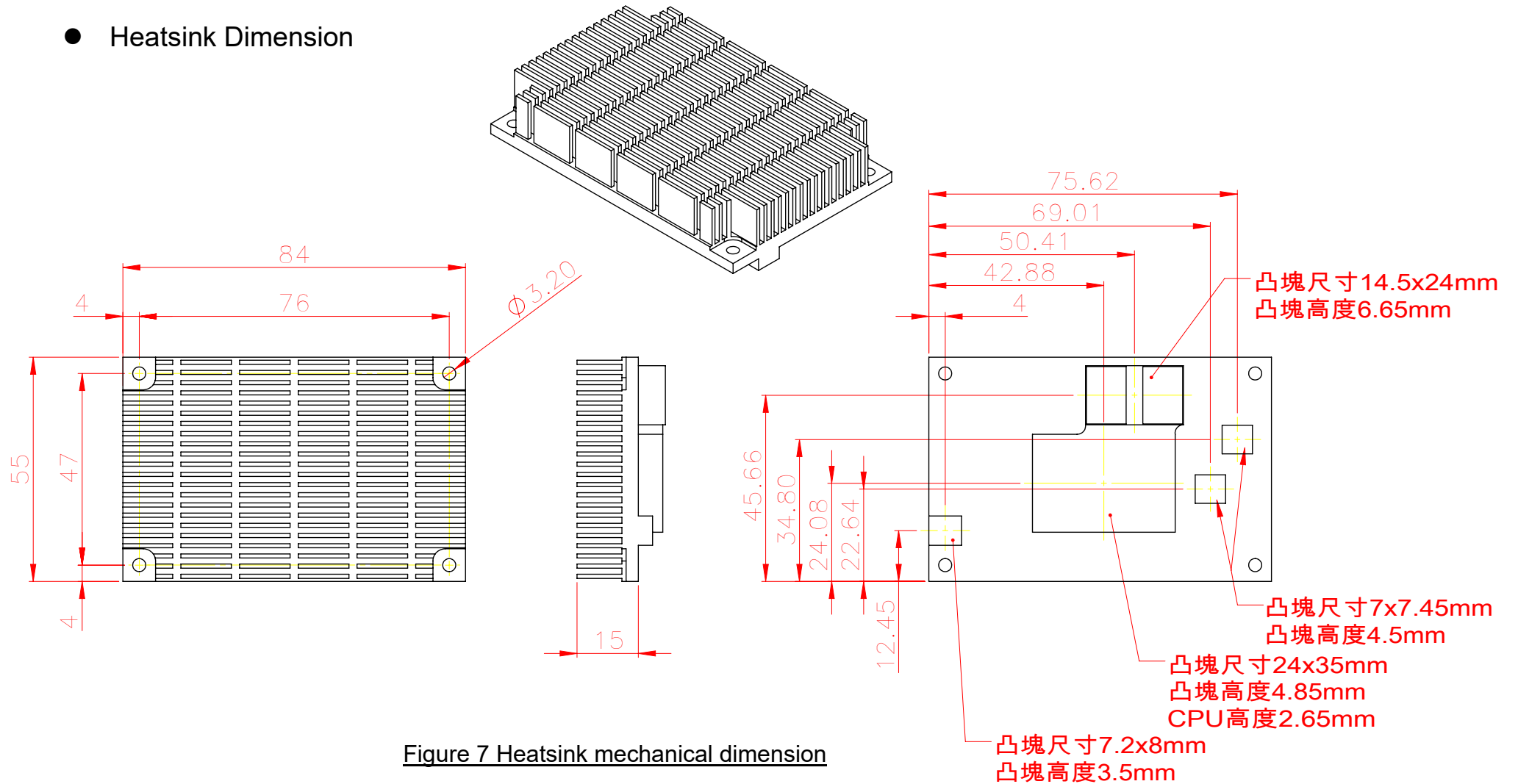
### ◆ Accessory

Accessory	Ordering P/N
Heatsink (Atom series)	B830B480
Heatspreader (Atom series)	B830B500
Heatsink (J/N series)	B830B490
Heatspreader (J/N series)	B830B510
Evaluation Carrier PCOM-CA00	AB1-3917

Table 8 Ordering Guide - Accessory

# 4 Thermal Solution

- Heatsink Dimension





● Heatspreader Dimension

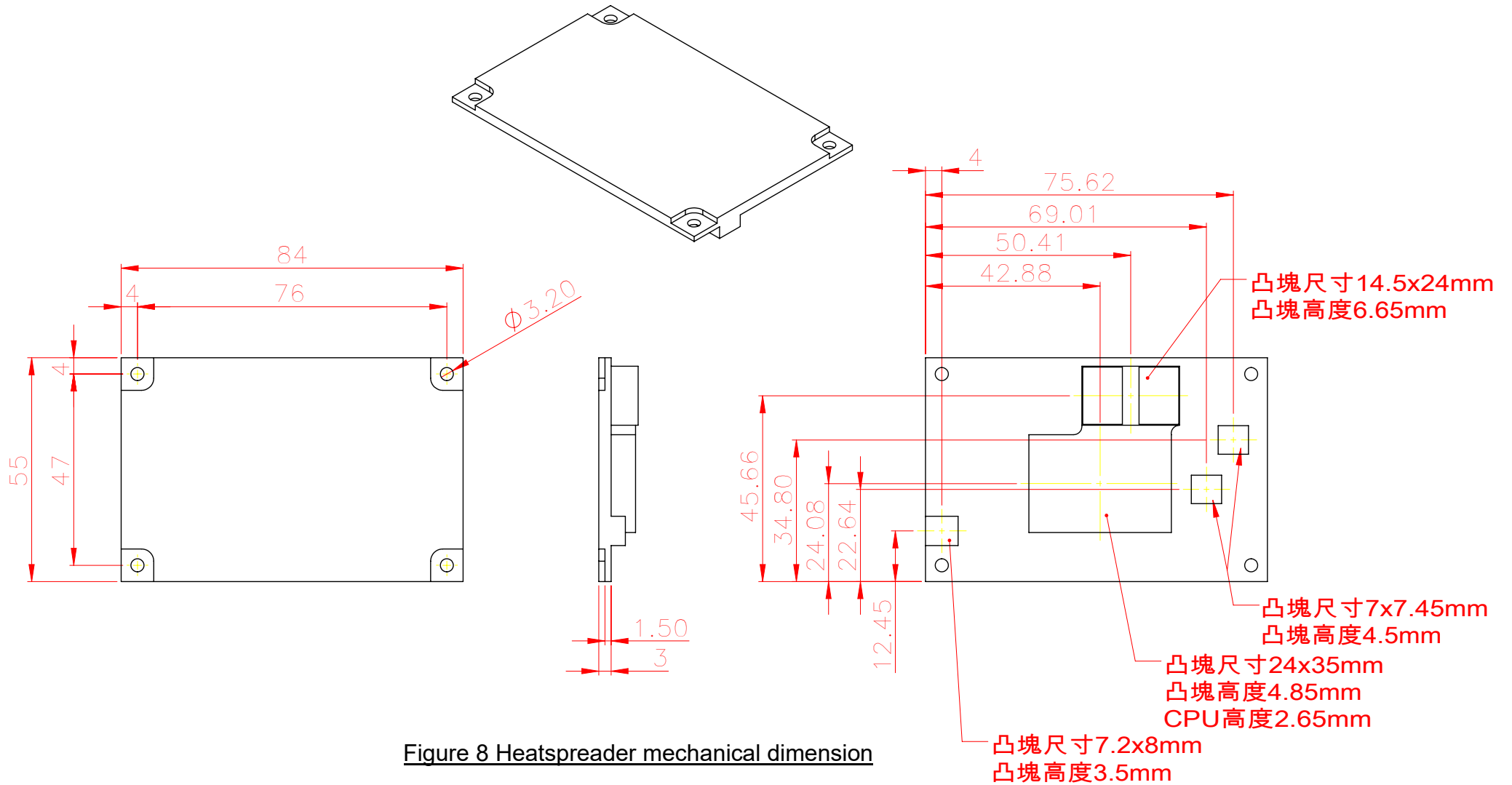


Figure 8 Heatspreader mechanical dimension

## 5 Pin out Tables

Pin	Row A	Row B
1	GND(FIXED)	GND(FIXED)
2	GBE0_MDI3-	GBE0_ACT#
3	GBE0_MDI3+	LPC_FRAME#
4	GBE0_LINK100#	LPC_AD0
5	GBE0_LINK1000#	LPC_AD1
6	GBE0_MDI2-	LPC_AD2
7	GBE0_MDI2+	LPC_AD3
8	GBE0_LINK#	LPC_DRQ0#
9	GBE0_MDI1-	LPC_DRQ1#
10	GBE0_MDI1+	LPC_CLK
11	GND(FIXED)	GND(FIXED)
12	GBE0_MDI0-	PWRBTN#
13	GBE0_MDI0+	SMB_CK
14	GBE0_CTREF	SMB_DAT
15	SUS_S3#	SMB_ALERT#
16	SATA0_TX+	SATA1_TX+
17	SATA0_TX-	SATA1_TX-
18	SUS_S4#	SUS_STAT#
19	SATA0_RX+	SATA1_RX+
20	SATA0_RX-	SATA1_RX-

21	GND(FIXED)	GND(FIXED)
22	USB_SSRX0-	USB_SSTX0-
23	USB_SSRX0+	USB_SSTX0+
24	SUS_S5#	PWR_OK
25	USB_SSRX1-	USB_SSTX1-
26	USB_SSRX1+	USB_SSTX1+
27	BATLOW#	WDT
28	(S)ATA_ACT#	HDA_SDIN2
29	HDA_SYNC	HDA_SDIN1
30	HDA_RST#	HDA_SDIN0
31	GND(FIXED)	GND(FIXED)
32	HDA_BITCLK	SPKR
33	HDA_SDOUT	I2C_CK
34	BIOS_DIS0#	I2C_DAT
35	THRMTRIP#	THRM#
36	USB6-	USB7-
37	USB6+	USB7+
38	USB_6_7_OC#	USB_4_5_OC#
39	USB4-	USB5-
40	USB4+	USB5+
41	GND(FIXED)	GND(FIXED)
42	USB2-	USB3-
43	USB2+	USB3+
44	USB_2_3_OC#	USB_0_1_OC#
45	USB0-	USB1-
46	USB0+	USB1+

47	VCC_RTC	NC
48	NC	NC
49	GBE0_SDP	SYS_RESET#
50	LPC_SERIRQ	CB_RESET#
51	GND(FIXED)	GND(FIXED)
52	NC	NC
53	NC	NC
54	GPI0	GPO1
55	NC	NC
56	NC	NC
57	GND	GPO2
58	PCIE_TX3+	PCIE_RX3+
59	PCIE_TX3-	PCIE_RX3-
60	GND(FIXED)	GND(FIXED)
61	PCIE_TX2+	PCIE_RX2+
62	PCIE_TX2-	PCIE_RX2-
63	GPI1	GPO3
64	PCIE_TX1+	PCIE_RX1+
65	PCIE_TX1-	PCIE_RX1-
66	GND	WAKE0#
67	GPI2	WAKE1#
68	PCIE_TX0+	PCIE_RX0+
69	PCIE_TX0-	PCIE_RX0-
70	GND(FIXED)	GND(FIXED)
71	LVDS_A0+	DDIO_PAIR0+
72	LVDS_A0-	DDIO_PAIR0-

73	LVDS_A1+	DDIO_PAIR1+
74	LVDS_A1-	DDIO_PAIR1-
75	LVDS_A2+	DDIO_PAIR2+
76	LVDS_A2-	DDIO_PAIR2-
77	LVDS_VDD_EN	DDIO_PAIR4+
78	LVDS_A3+	DDIO_PAIR4-
79	LVDS_A3-	LVDS_BKLT_EN
80	GND(FIXED)	GND(FIXED)
81	LVDS_A_CK+	DDIO_PAIR3+
82	LVDS_A_CK-	DDIO_PAIR3-
83	LVDS_I2C_CK	LVDS_BKLT_CTRL
84	LVDS_I2C_DAT	VCC_5V_SBY
85	GPI3	VCC_5V_SBY
86	NC	VCC_5V_SBY
87	NC	VCC_5V_SBY
88	PCIE_CK_REF+	BIOS_DIS1#
89	PCIE_CK_REF-	DDIO_HPD
90	GND(FIXED)	GND(FIXED)
91	SPI_POWER	DDIO_PAIR5+
92	SPI_MISO	DDIO_PAIR5-
93	GPO0	DDIO_PAIR6+
94	SPI_CLK	DDIO_PAIR6-
95	SPI_MOSI	DDIO_DDC_AUX_SEL
96	TPM_PP	USB7_HOST_PRSNT
97	TYPE10#	SPI_CS#
98	SER0_TX	DDIO_CTRLCLK_AUX+

99	SER0_RX	DDIO_CTRLDATA_AUX-
100	GND(FIXED)	GND(FIXED)
101	SER1_TX	FAN_PWMOUT
102	SER1_RX	FAN_TACHIN
103	LID#	SLEEP#
104	VCC_12V	VCC_12V
105	VCC_12V	VCC_12V
106	VCC_12V	VCC_12V
107	VCC_12V	VCC_12V
108	VCC_12V	VCC_12V
109	VCC_12V	VCC_12V
110	GND(FIXED)	GND(FIXED)

Table 9 Pin out description

## 6 BIOS Setup Items

PCOM-BA02GL is equipped with the AMI BIOS stored in Flash ROM. These BIOS has a built-in setup program that allows users to modify the basic system configuration easily. This type of information is stored in SPI ROM so that it is retained during power-off periods. When system is turned on, PCOM-BA02GL communicates with peripheral devices and checks its hardware resources against the configuration information stored in the BIOS. If any error is detected, or the BIOS parameters need to be initially defined, the diagnostic program will prompt the user to enter the SETUP program. Some errors are significant enough to abort the start up.

## 6.1 Entering Setup -- Launch System Setup

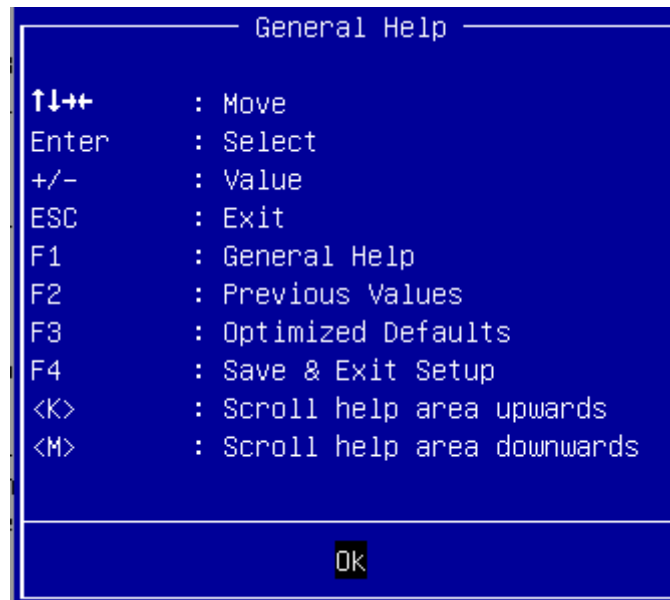
Power on the computer and the system will start POST (Power On Self Test) process. When the message below appears on the screen, press <Del> key will enter BIOS setup screen.

### Press <Del> 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.





## 6.2 Main

```
Aptio Setup - AMI
Main Configuration Security Boot Save & Exit

Project Name                PCOM-BA02
BIOS Version & Build Date   0.0.15 (01/26/2022 15:05:09)
EC Version & Build Date     0.10 (01/24/2022)
Access Level                Administrator

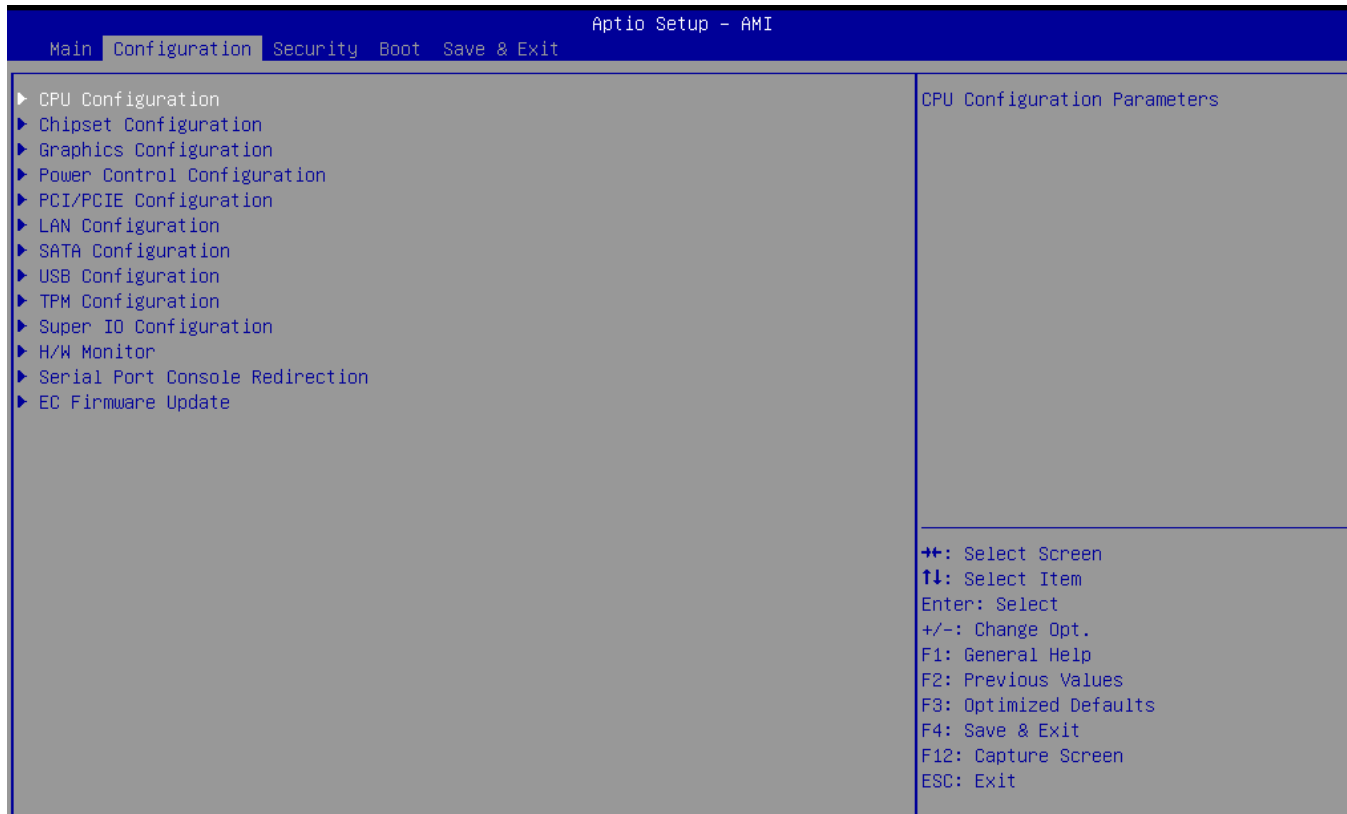
Compute Die Information
Name                        ElkhartLake ULX
Type                        Intel(R) Pentium(R) J6426 @ 2.00GHz
Speed                       2000 MHz
ID                           0x90661
Stepping                    B0
Package                     Not Implemented Yet
Number of Processors        4Core(s) / 4Thread(s)
Microcode Revision         15
GT Info                     GT4 (0x4571)
Memory RC Version          0.0.4.104
Total Memory                8192 MB
Memory Data Rate           3733 MTPS

PCH Information
Name                        EHL PCH
PCH SKU                     MCC SKU 0
Stepping                    B1

▶ Detailed System Information

System Date                 [Mon 02/14/2022]
System Time                 [12:26:46]
```

## 6.3 Configuration



## CPU Configuration

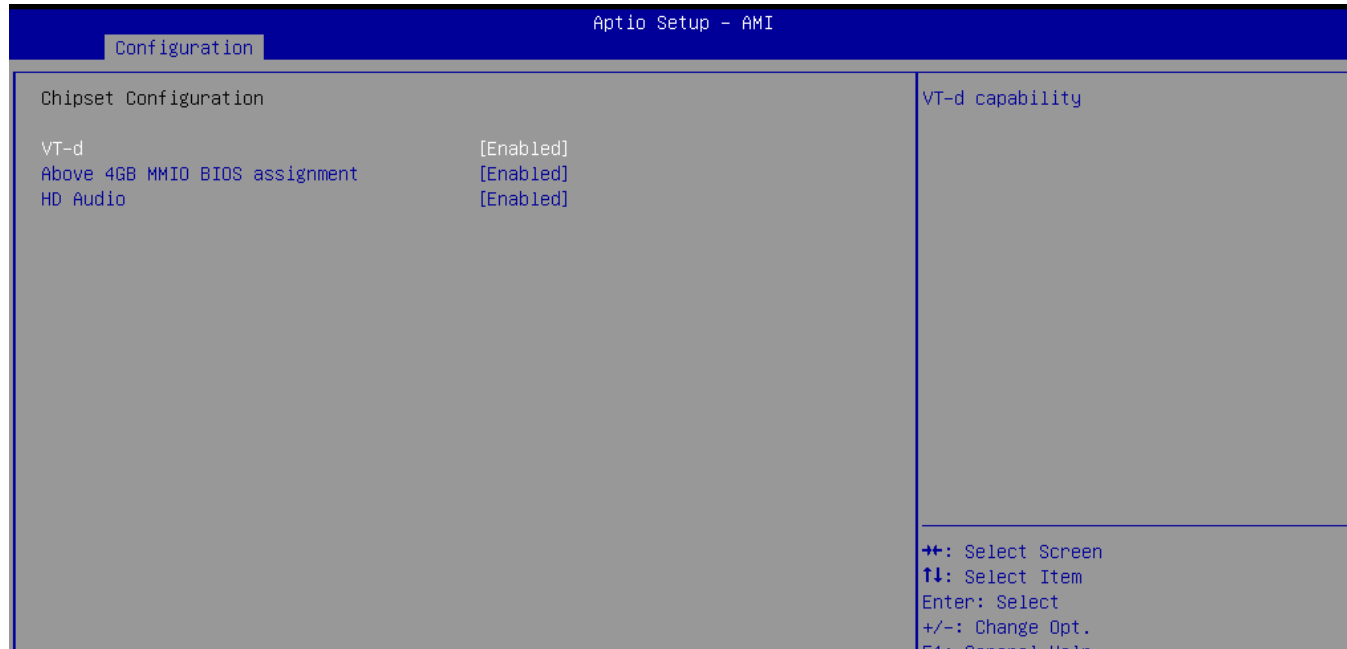
Aptio Setup - AMI

Configuration

CPU Configuration		Enable/Disable CPU Flex Ratio Programming
Type	Intel Atom(R) x6425E Processor @ 2.0...	
ID	0x90661	
Speed	2000 MHz	
L1 Data Cache	32 KB x 4	
L1 Instruction Cache	32 KB x 4	
L2 Cache	1536 KB x 4	
L3 Cache	4 MB	
L4 Cache	N/A	
VMX	Supported	
SMX/TXT	Not Supported	
CPU Flex Ratio Override	[Disabled]	
CPU Flex Ratio Settings	20	
Intel (VMX) Virtualization Technology	[Enabled]	
Active Processor Cores	[All]	
Boot performance mode	[Max Non-Turbo Performance]	
Intel(R) SpeedStep(tm)	[Enabled]	⇧⇩: Select Screen
Intel(R) Speed Shift Technology	[Enabled]	↑↓: Select Item
Turbo Mode	[Enabled]	Enter: Select
		+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		F12: Capture Screen
		ESC: Exit

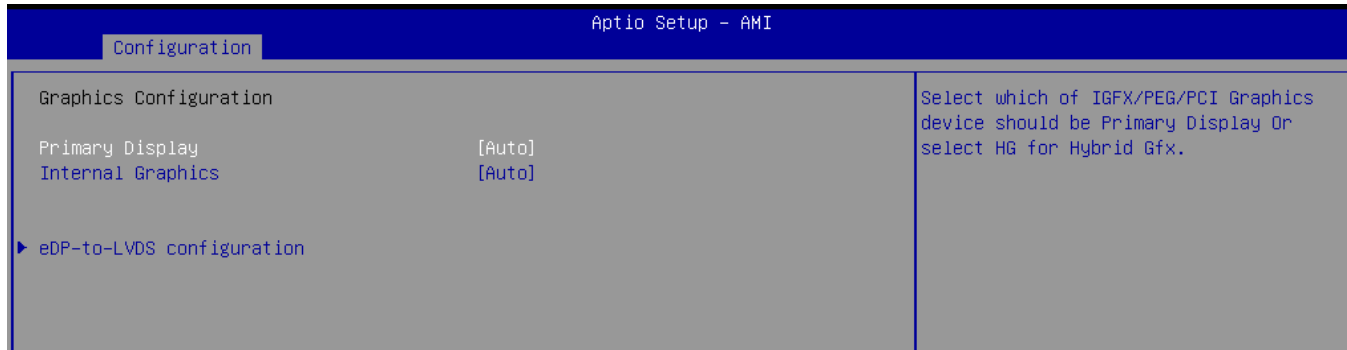
Feature	Description	Options
<b>CPU Flex Ratio Override</b>	Enable/Disable CPU Flex Ratio Programming	★Disabled, Enabled
<b>CPU Flex Ratio Settings</b>	This value must be between Max Efficiency Ratio (LFM) and Maximum non-turbo ratio set by Hardware (HFM).	★20
<b>Intel (VMX) Virtualization Technology</b>	When enabled, a VMM can utilize the additional hardware capabilities provided by Vander pool Technology.	★Enabled, Disabled
<b>Active Processor Cores</b>	Number of cores enable in each processor package.	★All, 1, 2, 3
<b>Boot performance mode</b>	Select the performance state that the BIOS will set starting from reset vector	★Max Non-Turbo Performance, Max Battery, Turbo Performance,
<b>Intel® SpeedStep™</b>	Allows more than two frequency ranges to be supported.	★Enabled, Disabled
<b>Intel® Speed Shift Technology</b>	Enable/Disable Intel® Speed Shift Technology support. Enabling will expose the CPPC v2 interface to allow for hardware controlled P-states	★Enabled, Disabled
<b>Turbo Mode</b>	Enable/Disable processor Turbo Mode (requires EMTTM enabled too). AUTO means enabled.	★Enabled, Disabled

## Chipset Configuration



Feature	Description	Options
<b>VT-d</b>	VT-d Capability	★Enabled ,Disabled
<b>Above 4GB MMIO BIOS assignment</b>	Enable/Disable above 4GB Memory Mapped IO BIOS assignment This is enabled automatically when Aperture Size is set to 2048MB	★Enabled ,Disabled
<b>HD Audio</b>	Control Detection of the HD-Audio device. Disabled = HAD will be unconditionally disabled Enabled = HAD will be unconditionally enabled	★Enabled ,Disabled

## Graphics Configuration

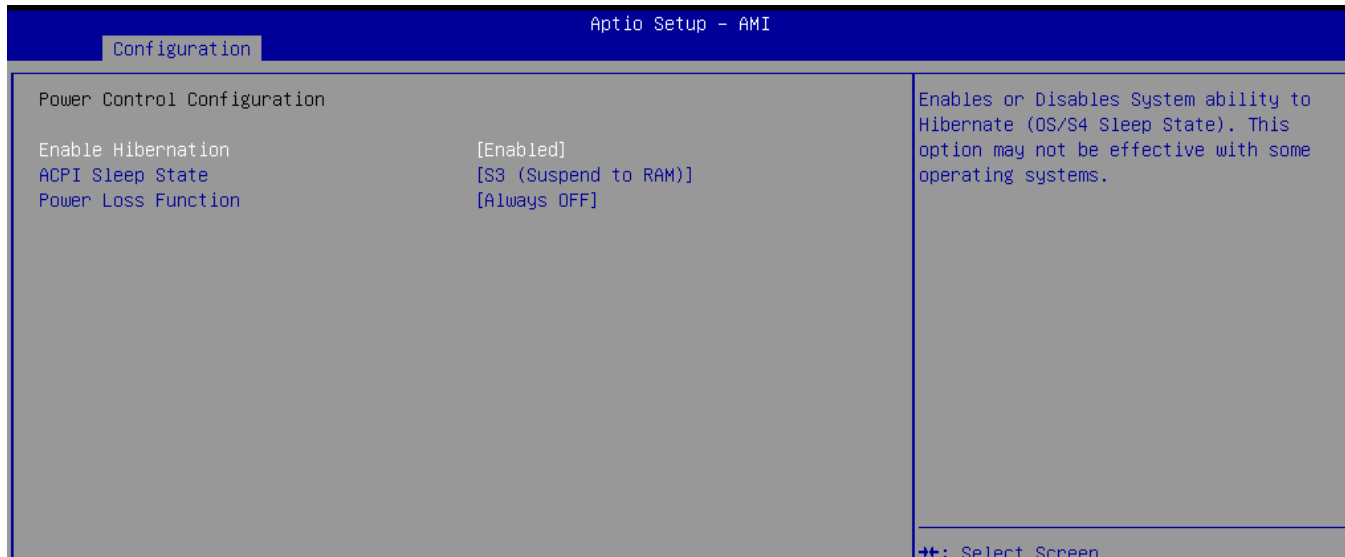


Feature	Description	Options
<b>Primary Display</b>	Select which of IGFX/PEG/PCI Graphics device should be Primary Display Or select HG for Hybrid Gfx.	★Auto, IGFX, PEG, PCI
<b>Internal Graphics</b>	Keep IGFX enabled based on the setup options.	★Auto, Disabled, Enabled

### eDP-to-LVDS configuration

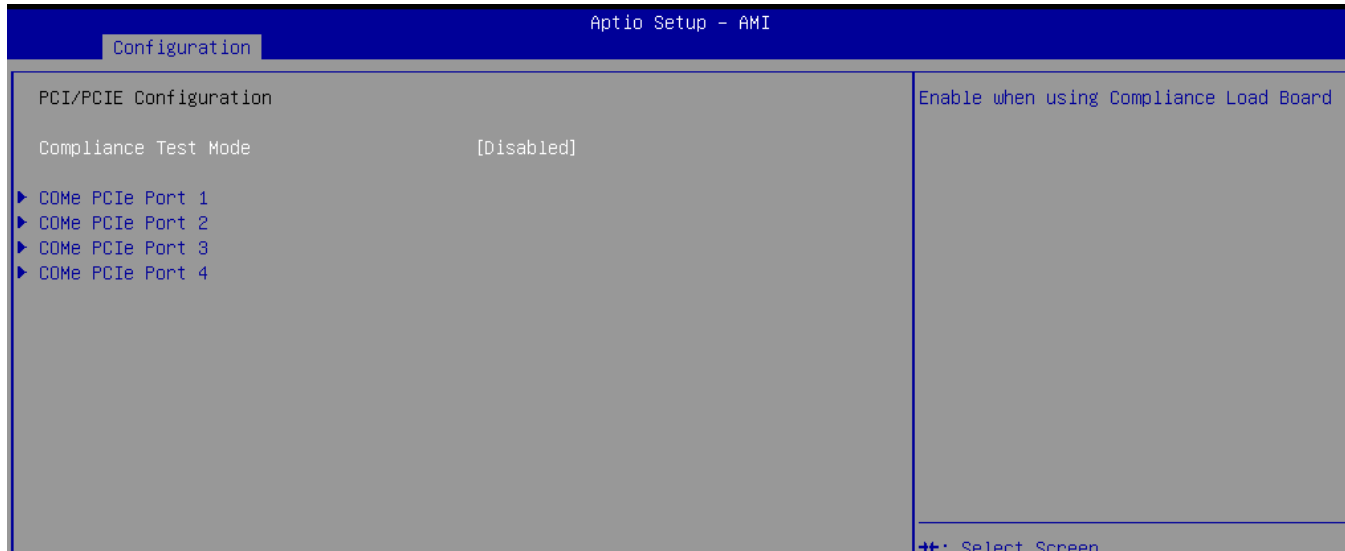
Feature	Description	Options
<b>Panel Profile</b>	Select Panel Profile for current use.	★1024x768,640x480,800x480,800x600,1280x800 1280x1024,1366x768,1440x900,1920x1080,OEM Profile
<b>Color depth and data format</b>	Select Color depth and data format	★VESA 24 bpp, JEIDA 24 bpp, VESA and JEIDA 18 bpp,
<b>Channel Mode</b>	Select LVDS Channel Mode	★Single Channel, Dual Channel
<b>Clock Mode</b>	Select clock output for LVDS.	★Even Bus, Odd Bus, Both Buses

## Power Control Configuration



Feature	Description	Options
<b>Enable Hibernation</b>	Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may not be effective with some operating systems.	★Enabled, Disabled
<b>ACPI Sleep State</b>	Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed.	★S3 (Suspend to RAM), Suspend Disabled
<b>Restore AC Power Loss</b>	Specify what state to go to when power is re-applied after a power failure (G3 state)	★Power Off, Power On, Last State

## PCI/PCIE Configuration



Feature	Description	Options
<b>Enable Hibernation</b>	Enables when using Compliance Load Board.	★Disabled, Enabled



**COMe PCIe Port 1 / COMe PCIe Port 2 / COMe PCIe Port 3 / COMe PCIe Port 4**

<b>Feature</b>	<b>Description</b>	<b>Options</b>
<b>COMe PCIe Port</b>	Control the PCI Express Root Port.	★Enabled , Disabled
<b>Connection Type</b>	Built-In: a built-in device is connected to this root port. Slot Implemented bit will be clear. Slot: this root port connects to user-accessible slot. Slot Implemented bit will be set.	★Slot, Built-in
<b>ASPM</b>	Set the ASPM Level: Force L0s – Force all links to L0s State AUTO - BIOS auto configure DISABLE – Disables ASPM	★Disabled, L0s, L1, L0sL1, Auto
<b>L1 Substrates</b>	PCI Express L1 Substrates settings.	★L1.1 & L1.2, L1.1, Disabled
<b>ACS</b>	Enable/Disable Access Control Services Extended Capability.	★Enabled , Disabled
<b>PTM</b>	Enable/Disable Precision Time Measurement.	★Disabled, Enabled
<b>DPC</b>	Enable/Disable Downstream Port Containment.	★Enabled , Disabled
<b>EDPC</b>	Enable/Disable Root port extensions for Downstream Port Containment	★Enabled , Disabled
<b>URR</b>	PCI Express Unsupported Request Reporting Enable/Disable.	★Disabled, Enabled
<b>FER</b>	PCI Express Device Fatal Error Reporting Enable/Disable.	★Disabled, Enabled
<b>NFER</b>	PCI Express Device Non-Fatal Error Reporting Enable/Disable.	★Disabled, Enabled
<b>CER</b>	PCI Express Device Correctable Error Reporting Enable/Disable.	★Disabled, Enabled
<b>SEFE</b>	Root PCI Express System Error on Fatal Error Enable/Disable.	★Disabled, Enabled
<b>SENF</b>	Root PCI Express System Error on Non-Fatal Error Enable/Disable.	★Disabled, Enabled
<b>SECE</b>	Root PCI Express System Error on Correctable Error Enable/Disable.	★Disabled, Enabled
<b>PME SCI</b>	PCI Express PME SCI Enable/Disable.	★Enabled , Disabled
<b>Hot Plug</b>	PCI Express Hot Plug Enable/Disable.	★Disabled, Enabled
<b>Advanced Error Reporting</b>	Advanced Error Reporting Enable/Disable.	★Enabled , Disabled

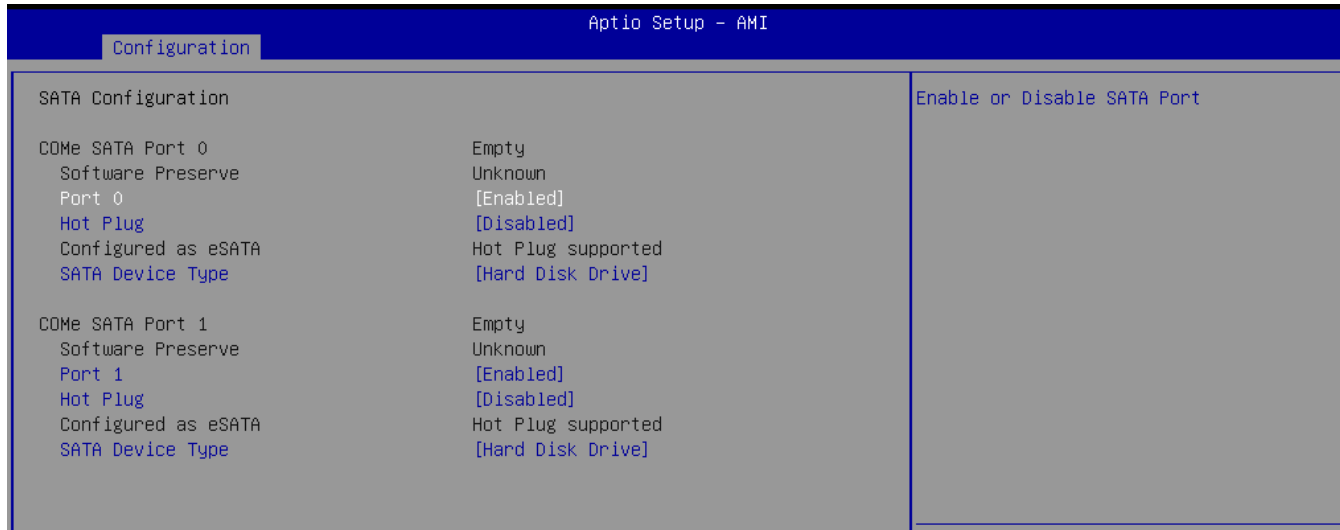
<b>PCIe Speed</b>	Configure PCIe Speed.	★Auto, Gen1, Gen2, Gen3
<b>Transmitter Half Swing</b>	Transmitter Half Swing Enable/Disable.	★Disabled, Enabled
<b>Detect Timeout</b>	The number of milliseconds reference code will wait for link to exit Detect state for enabled ports before assuming there is no device and potentially disabling the port.	★0
<b>Extra Bus Reserved</b>	Extra Bus Reserved (0-7) for bridges behind this Root Bridge.	★0
<b>Reserved Memory</b>	Reserved Memory for this Root Bridge (1-20) MB	★10
<b>Reserved I/O</b>	Reserved I/O (4K/8K/12K/16K/20K) Range for this Root Bridge.	★4
<b>LTR</b>	PCH PCIE Latency Reporting Enable/Disable	★Enabled , Disabled
<b>Snoop Latency Override</b>	Snoop Latency Override for PCH PCIE. Disabled: Disable override. Manual: Manually enter override values. Auto (default): Maintain default BIOS flow.	★Auto, Manual, Disabled
<b>Snoop Latency Value</b>	LTR Snoop Latency value of PCH PCIE.	★60
<b>Snoop Latency Multiplier</b>	LTR Snoop Latency Multiplier of PCH PCIE.	★1024ns, 1ns, 32ns, 32768ns, 1048576ns, 33554432ns
<b>Non Snoop Latency Override</b>	Non Snoop Latency Override for PCH PCIE. Disabled: Disable override. Manual: Manually enter override values. Auto (default): Maintain default BIOS flow.	★Auto, Manual, Disabled
<b>Non Snoop Latency Value</b>	LTR Non Snoop Latency value of PCH PCIE	★60
<b>Non Snoop Latency Multiplier</b>	LTR Non Snoop Latency Multiplier of PCH PCIE.	★1024ns, 1ns, 32ns, 32768ns, 1048576ns, 33554432ns
<b>Force LTR Override</b>	Force LTR Override for PCH PCIE. Disabled: LTR override values will not be forced. Enable: LTR override values will be forced and LTR messages from the device will be ignored.	★Disabled, Enabled
<b>LTR Lock</b>	PCIE LTR Configuration Lock	★Disabled, Enabled

## LAN Configuration



Feature	Description	Options
<b>Intel PSE TSN GbE #0 (SGMII Mode)</b>		
<b>PSE TSN GBE 0</b>	Select ownership for GBE.	Host owned with pin muxed, SPE owned with pin muxed, None
<b>PSE TSN GBE 0 Link Speed</b>	PSE TSN GBE 0 Link Speed configuration.	SGMII 1 Gbps, SGMII 2.5 Gbps
<b>WOL</b>	Enable/Disable PSE GBE WOL.	★Enabled , Disabled
<b>Launch UEFI PXE ROM</b>	Enable/Disable UEFI Network Stack	★Disabled, Enabled
<b>Launch UEFI PXE ROM (Enabled)</b>		
<b>IPv4 PXE Support</b>	Enable/Disable IPv4 PXE boot support. If disabled, IPv4 PXE boot support Will not be available.	★Enabled , Disabled
<b>IPv4 HTTP Support</b>	Enable/Disable IPv4 HTTP boot support. If disabled, IPv4 HTTP boot support Will not be available.	★Enabled , Disabled
<b>IPv6 PXE Support</b>	Enable/Disable IPv6 PXE boot support. If disabled, IPv6 PXE boot support Will not be available.	★Enabled , Disabled
<b>IPv6 HTTP Support</b>	Enable/Disable IPv6 HTTP boot support. If disabled, IPv6 HTTP boot support Will not be available.	★Enabled , Disabled

## SATA Configuration



Feature	Description	Options
<b>Serial ATA Port 0</b>		
<b>Port 0</b>	Enabled or Disabled SATA Port.	★Enabled , Disabled
<b>Hot plug</b>	Designates this port as Hot pluggable.	★Disabled, Enabled
<b>SATA Device Type</b>	Identify the SATA port is connected to Solid State Drive or Hard Disk Drive.	★Hard Disk Drive, Solid State Drive
<b>Serial ATA Port 1</b>		
<b>Port 1</b>	Enabled or Disabled SATA Port	★Enabled , Disabled
<b>Hot plug</b>	Designates this port as Hot pluggable.	★Disabled, Enabled
<b>SATA Device Type</b>	Identify the SATA port is connected to Solid State Drive or Hard Disk Drive.	★Hard Disk Drive, Solid State Drive

## USB Configuration

Aptio Setup - AMI

Configuration

USB Configuration		This is a workaround for OSES without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.
USB Controllers: 1 XHCI USB Devices: 1 Drive, 1 Keyboard		
XHCI Hand-off	[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
USB Mass Storage Driver Support	[Enabled]	
COMe USB 3.0 Port 0	[Enabled]	
COMe USB 3.0 Port 1	[Enabled]	
COMe USB 2.0 Port 0	[Enabled]	
COMe USB 2.0 Port 1	[Enabled]	
COMe USB 2.0 Port 2	[Enabled]	
COMe USB 2.0 Port 3	[Enabled]	
COMe USB 2.0 Port 4	[Enabled]	
COMe USB 2.0 Port 5	[Enabled]	
COMe USB 2.0 Port 6	[Enabled]	
COMe USB 2.0 Port 7	[Enabled]	
USB hardware delays and time-outs:		
USB transfer time-out	[20 sec]	
Device reset time-out	[20 sec]	
Device power-up delay	[Auto]	
Mass Storage Devices:		
KingstonDataTraveler 3.0PMAP	[Auto]	

Version 2.22.1282 Copyright (C) 2022 AMI

Feature	Description	Options
<b>XHCI Hand-off</b>	This is a workaround for OSES without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.	★Enabled , Disabled
<b>USB Mass Storage Driver Support</b>	Enable/Disable USB Mass Storage Driver Support.	★Enabled , Disabled
<b>COMe USB 3.0 Port 0 &amp; COMe USB 3.0 Port 1</b>	Enable/Disable this USB Physical Connector (physical port). Once disabled, any USB device plug into the connector will not be detected by BIOS or OS.	★Enabled , Disabled
<b>COMe USB 2.0 Port 0 ~ COMe USB 2.0 Port 7</b>	Enable/Disable this USB Physical Connector (physical port). Once disabled, any USB device plug into the connector will not be detected by BIOS or OS.	★Enabled , Disabled
<b>USB transfer time-out</b>	The time-out value for Control, Bulk, and Interrupt transfers.	★20 sec , 1 sec, 5 sec, 10 sec
<b>Device reset time-out</b>	USB mass storage device Start Unit command time-out.	★20 sec, 10 sec, 30 sec, 40 sec
<b>Device power-up delay</b>	Maximum time the device will take before it properly reports itself to the Host Controller. 'Auto' uses default value: for a Root port it is 100 ms, for a Hub port the delay is taken from Hub descriptor.	★Auto, Manual
<b>Device power-up delay -- ★Manual</b>		
<b>Device power-up delay in seconds</b>	Delay range is 1..40 seconds, in one second increments	★5

## TPM 2.0 Device Found

Aptio Setup - AMI

Configuration

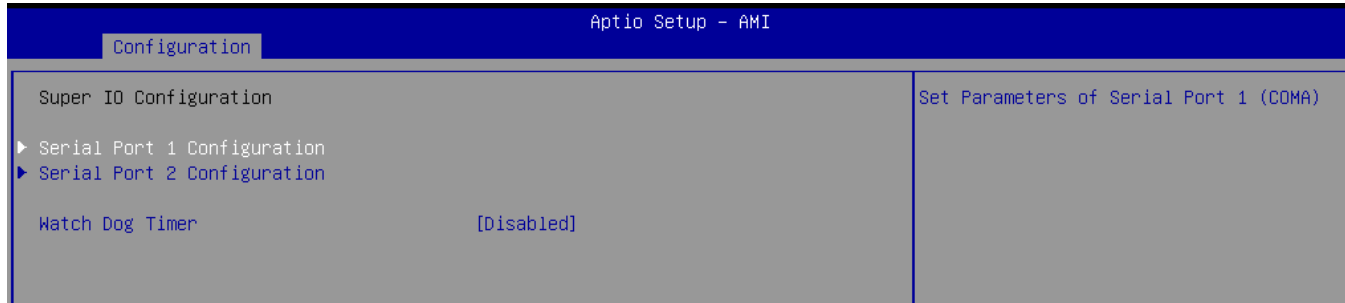
TPM 2.0 Device Found		Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.
Firmware Version:	7.85	
Vendor:	IFX	
Security Device Support	[Enable]	
Active PCR banks	SHA256	
Available PCR banks	SHA256	
SHA256 PCR Bank	[Enabled]	
Pending operation	[None]	
Platform Hierarchy	[Enabled]	
Storage Hierarchy	[Enabled]	
Endorsement Hierarchy	[Enabled]	
TPM 2.0 UEFI Spec Version	[TCG_2]	
Physical Presence Spec Version	[1.3]	
TPM 2.0 InterfaceType	[TIS]	
Device Select	[Auto]	

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



Feature	Description	Options
<b>Security Device Support</b>	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
<b>SHA256 PCR Bank</b>	Enables or Disables SHA256 PCR Bank.	★Enabled, Disabled
<b>Pending operation</b>	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
<b>Platform Hierarchy</b>	Enables or Disables Platform Hierarchy.	★Enabled, Disabled
<b>Storage Hierarchy</b>	Enables or Disables Storage Hierarchy.	★Enabled, Disabled
<b>Endorsement Hierarchy</b>	Enables or Disables Endorsement Hierarchy.	★Enabled, Disabled
<b>TPM2.0 UEFI Spec Version</b>	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
<b>Physical Presence Spec Version</b>	Select to Tell O.S. to Support PPI Spec Version 1.2 or 1.3. Not some HCK tests might not support 1.3.	★1.3, 1.2
<b>Device Select</b>	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

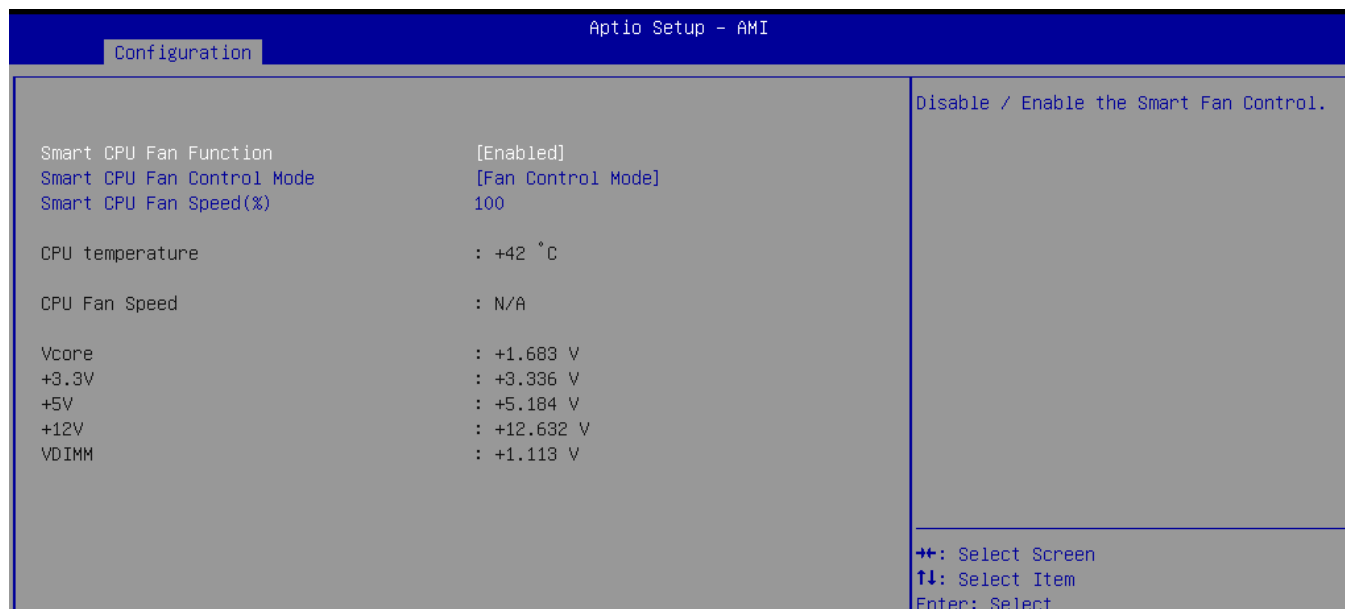


Feature	Description	Options
<b>Watch Dog Timer</b>	Enable/Disable Watch Dog Timer	★Disabled, Enabled
<b>Watch Dog Timer [Enabled]</b>		
<b>Timer Unit</b>	Select Timer count unit of WDT	★Second, Minute
<b>Timer value</b>	Set WDT Timer value seconds / minutes	★20

### Serial Port 1 Configuration / Serial Port 2 Configuration

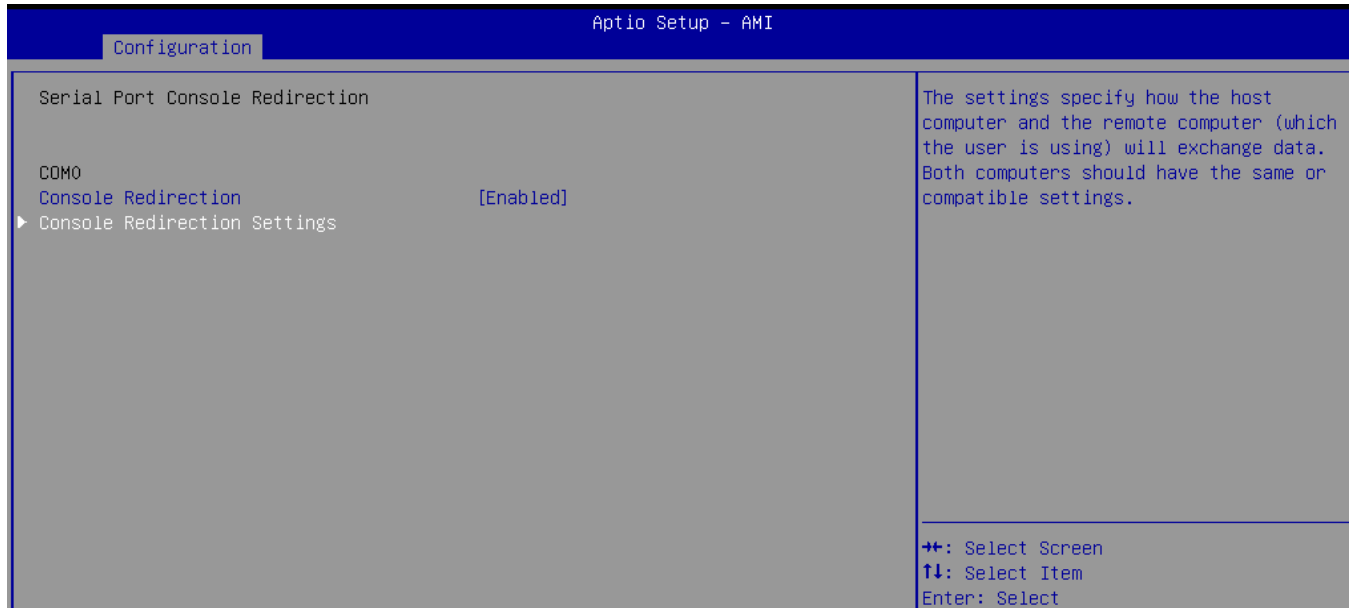
Feature	Description	Options
<b>Module Serial Port 1 / 2</b>	Enable or Disable Serial Port (COM)	★Enabled, Disabled
<b>Change Settings</b>	Select an optimal setting for Super IO Device	★Auto ,IO=3F8h; IRQ=4, IO=3F8h; IRQ=3,4,10,11 IO=2F8h; IRQ=3,4,10,11 IO=3E8h; IRQ=3,4,10,11 IO=2E8h; IRQ=3,4,10,11,

## HW Monitor



Feature	Description	Options
<b>Smart CPU Fan Function</b>	Disable / Enable the smart Fan Control	★Disabled, Enabled
<b>Smart CPU Fan Function [Enabled]</b>		
<b>Smart CPU Fan Control Mode</b>	Select smart Fan Control Mode	★Fan Control Mode
<b>Smart CPU Fan Speed (%)</b>	Select smart Fan1 speed 0 – 100%	★100

## Serial Port Console Redirection

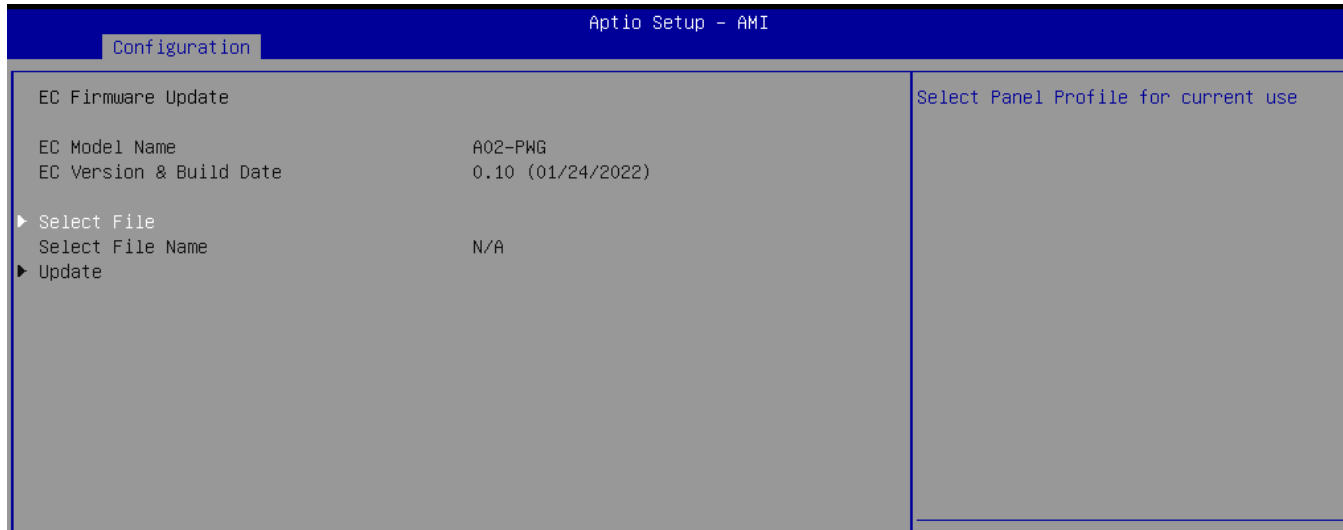


Feature	Description	Options
<b>COM0 Console Redirection</b>	Console Redirection Enable or Disable	★Disabled, Enabled

**COM0 Console Redirection Settings**

Feature	Description	Options
<b>Terminal Type</b>	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.	★VT100+, ANSI, VT100, VT-UTF8
<b>Bits per second</b>	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
<b>Data bits</b>	Data bits.	★8, 7
<b>Parity</b>	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
<b>Stop Bits</b>	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
<b>Flow Control</b>	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
<b>VT-UTF8 Combo Key Support</b>	Enable VT-UTF8 Combination Key Support for ANSI / VT100 terminals.	★Enabled, Disabled
<b>Recorder Mode</b>	With this mode enabled only text will be sent. This is to capture Terminal data.	★Disabled, Enabled
<b>Resolution 100x31</b>	Enables or disables extended terminal resolution.	★Disabled, Enabled
<b>Putty KeyPad</b>	Select Function Key and KeyPad on Putty.	★VT100, LINUX, XTERMR6, SCO, ESCN, VT400

## EC Firmware Update



Feature	Description	Options
<b>Select File</b>	Select ROM image	Bin file to the USB DOK

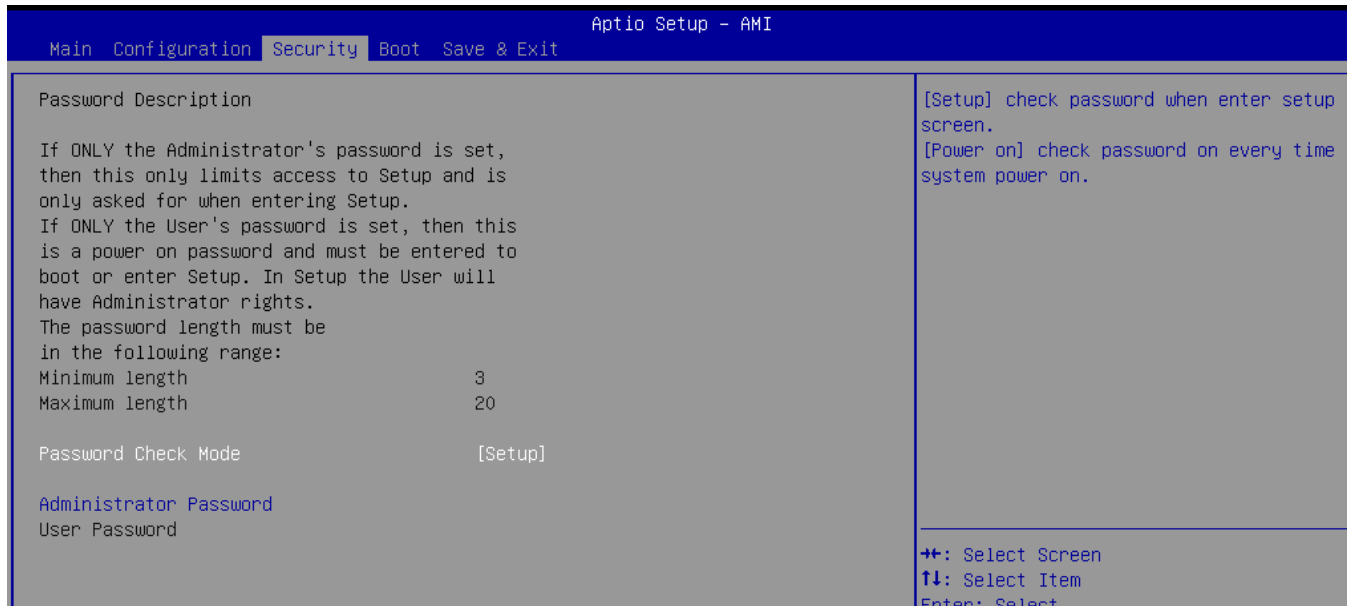
### Update EC

Step 1. Prepare a USB DOK.

Step 2. Unzip update file to the USB DOK.

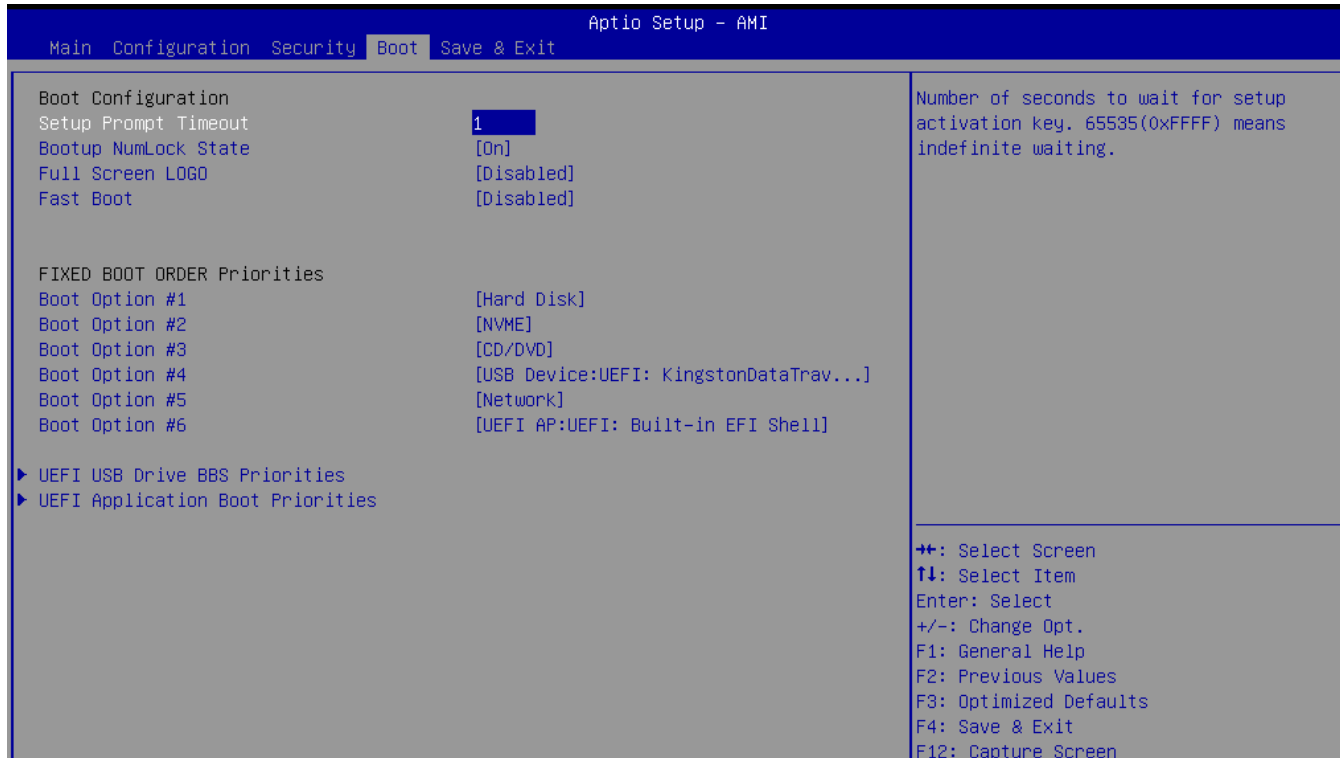
Step 3. Select File System (USB DOK)

## 6.4 Security



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

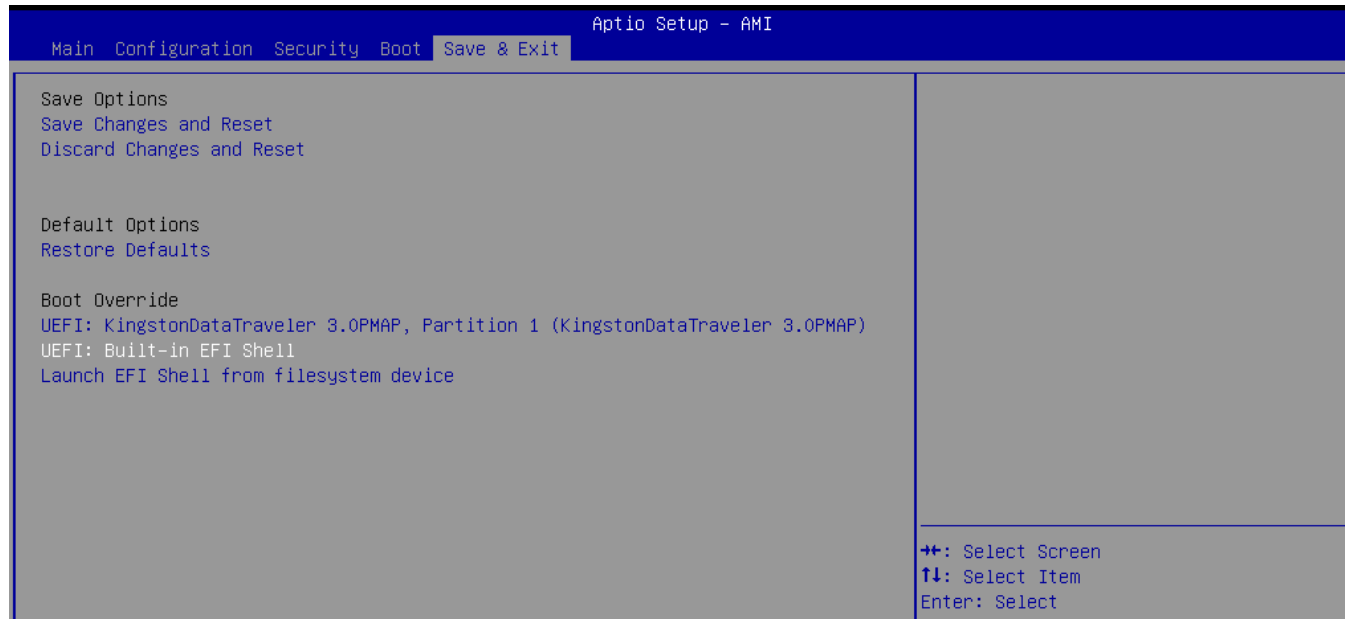
## 6.5 Boot





Feature	Description	Options
<b>Setup Prompt Timeout</b>	Number of seconds to wait for setup activation key. 65535 (0xFFFF) means indefinite waiting.	★1
<b>Bootup NumLock State</b>	Select the keyboard NumLock state.	★On, Off
<b>Full Screen LOGO</b>	Enables or disables Quiet Boot option and Full screen LOGO.	★Disabled, Enabled
<b>Fast Boot</b>	Enables or disables boot with initialization of a minimal set of devices required to launch active boot option. Has no effect for BBS boot options.	★Disabled, Enabled
<b>Boot Option #1 ~ #6</b>	Sets the system boot order	Hard Disk, UEFI AP: UEFI: Built-in EFI Shell, CD/DVD, USB Device; Network, Disabled
<b>UEFI Application Boot Priorities</b>	Specifies the Boot Device Priority sequence from available UEFI Application	

## 6.6 Save & Exit



Feature	Description	Options
<b>Save Changes and Reset</b>	Reset the system after saving the changes.	
<b>Discard Changes and Reset</b>	Reset system setup without saving any changes.	
<b>Restore Defaults Values</b>	Restore/Load Default values for all the setup options.	
<b>Launch EFI Shell from filesystem device</b>	Attempts to Launch EFI Shell application (Shell.efi) from one of the available filesystem devices.	

## 7 System Resources

### LPC

Device	I/O Address	Note
Embedded Controller	0x6E / 0x6F	EC Address
	0x62 / 0x66	EC ACPI CMD Port
	0x200 / 0x201	EC BRAM Port for I2C function
	0x300~0x3FF	EC LPC IO Space
	0x3F8~0x3FF	EC UART1
	0x3E8~0x3EF	EC UART2
Carrier SIO	N/A	

### SMBUS

SMBUS Address	Information
0x44	SMBus ARP
0x6C	PCIe Clock Buffer
0x10 / 0x12 / 0x16 / 0x48	Reserved

Table 10 System Resources

## 8 BIOS/EC Update

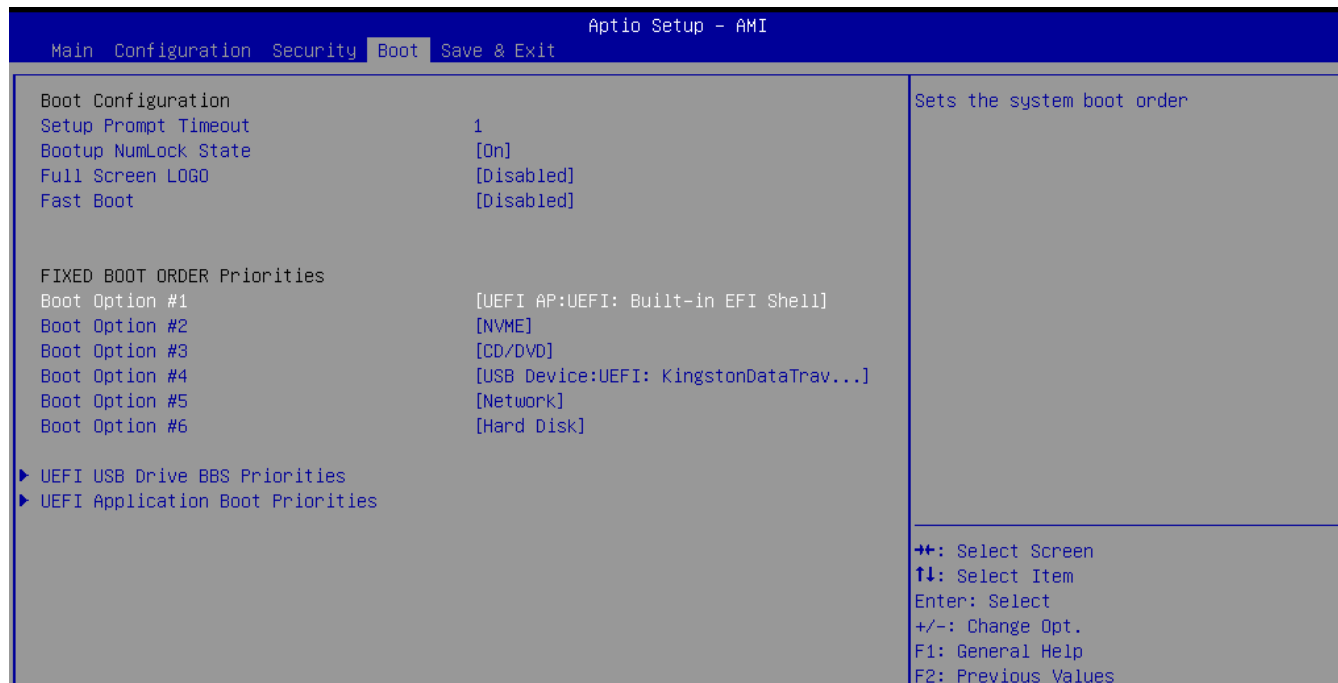
PCOM-BA02GL only support BIOS/EC update under UEFI shell environment, refer the following step, please.

Step 1. Prepare a USB DOK.

Step 2. Unzip update file to the USB DOK.

Step 3. Select UEFI: Built-in EFI Shell in the BIOS boot menu and save then restarts the system.

Step 4. Plug the USB DOK into the target system and boot from UEFI Shell.



Step 5. Under the UEFI shell, change prompt to your USB DOK, the below example is “**fs0:**”

Step 6. Then change the folder with updated file and use command: “**update**” and press enter

```
UEFI Interactive Shell v2.2
EDK II
UEFI v2.70 (American Megatrends, 0x00050013)
Mapping table
  FS0: Alias(s):HD0c0b:;BLK1:
      PciRoot(0x0)/Pci(0x14,0x0)/USB(0x2,0x0)/HD(1,GPT,C8F8A9FB-1001-42A6-A0
      BA-FC25E7CC61DC,0x800,0x1CDF7DF)
  BLK0: Alias(s):
      PciRoot(0x0)/Pci(0x14,0x0)/USB(0x2,0x0)
  BLK2: Alias(s):
      PciRoot(0x0)/Pci(0x1A,0x0)/eMMC(0x0)
Press ESC in 5 seconds to skip startup.nsh or any other key to continue.
Shell> fs0:
FS0:\> cd BIOS_Update
FS0:\BIOS_Update\> Update.efi_
```

(BIOS file update sample)

```
UEFI Interactive Shell v2.2
EDK II
UEFI v2.70 (American Megatrends, 0x00050013)
Mapping table
  FS0: Alias(s):HD0c0b:;BLK1:
        PciRoot(0x0)/Pci(0x14,0x0)/USB(0x2,0x0)/HD(1,GPT,C8F8A9FB-1001-42A6-A0
BA-FC25E7CC61DC,0x800,0x1CDF7DF)
  BLK0: Alias(s):
        PciRoot(0x0)/Pci(0x14,0x0)/USB(0x2,0x0)
  BLK2: Alias(s):
        PciRoot(0x0)/Pci(0x1A,0x0)/eMMC(0x0)
Press ESC in 5 seconds to skip startup.nsh or any other key to continue.
Shell> fs0:
FS0:\> CD EC_Update
FS0:\EC_Update> Update.efi_
```

(EC file update sample)

Step 7. The updating process will start and you can see the updating progress. Once finished, please power off and restart the system.

```
Mapping table
FS0: Alias(s):HD0c0b:;BLK1:
      PciRoot(0x0)/Pci(0x14,0x0)/USB(0x2,0x0)/HD(1,GPT,C8F8A9FB-1001-42A6-A0
BA-FC25E7CC61DC,0x800,0x1CDF7DF)
BLK0: Alias(s):
      PciRoot(0x0)/Pci(0x14,0x0)/USB(0x2,0x0)
BLK2: Alias(s):
      PciRoot(0x0)/Pci(0x1A,0x0)/eMMC(0x0)
Intel (R) Flash Programming Tool Version: 15.40.0.1017
Copyright (C) 2005 - 2020, Intel Corporation. All rights reserved.

Reading HSFSTS register... Flash Descriptor: Valid

--- Flash Devices Found ---
ID:0xC22019      Size: 32768KB (262144Kb)

GbE Region does not exist.

- Erasing Flash Block [0x2000000] - 100 percent complete.
- Programming Flash [0x2000000] 32768KB of 32768KB - 100 percent complete.
RESULT: The data is identical.32768KB of 32768KB - 100 percent complete.

FPT Operation Successful.

FS0:\BIOS_Update\> _
```

(BIOS updating progress)

```

    FS0: Alias(s):HD0c0b::BLK1:
           PciRoot(0x0)/Pci(0x14,0x0)/USB(0x2,0x0)/HD(1,GPT,C8F8A9FB-1001-42A6-A0
BA-FC25E7CC61DC,0x800,0x1CDF7DF)
    BLK0: Alias(s):
           PciRoot(0x0)/Pci(0x14,0x0)/USB(0x2,0x0)
    BLK2: Alias(s):
           PciRoot(0x0)/Pci(0x1A,0x0)/eMMC(0x0)
Current shell version is v2.x
ITE EC Flash Utility for UEFI Shell, Version : 1.4.0 (64)
<Re-Write by FoxYang .. 2021/12/22 >

[/NOKBC] support
!!Please don't use KB/MS during updating
Device ID       : EF 40 14 0
SPI Vendor      : Winbond
Erasing...     : ████████████████████ -- Erase OK.

Erase Verify... : ████████████████████ -- Erase Verify OK.

Programing...  : ████████████████████ -- Programing OK.

Verify...     : ████████████████████ -- Verify OK.

Please turn off power(G3) by manual , let EC reload new image !!
FS0:\EC_Update\>

```

(EC updating progress)



## 9 PORTWELL Software Tool

### PORTWELL Evaluation Tool (PET)

The PORTWELL Evaluation Tool (PET) is an API which PORTWELL's customers can access the GPIO, I2C, SMBus, etc under Windows and Linux OS. For further information please contact PORTWELL.

### PORTWELL BIOS web Tool (PBT)

The PORTWELL BIOS web Tool (PBT) is a brand new on-line utility innovated by PORTWELL. PBT now is available for PORTWELL's premiere customers who are able to **add customized BIOS logo** and **change BIOS default settings** on American Megatrends Inc. (AMI) BIOS. Please contact PORTWELL for further information.

### PORTWELL EC Auto Test Tool (PECAT)

The PORTWELL EC Auto Test Tool (PECAT) is a brand new utility innovated by PORTWELL. PECAT now is available for PORTWELL's premiere customers, who are able to **Test Embedded Controller Function** in UEFI Mode. Please contact PORTWELL for further information.

## 10 Packaging Information

PCOM-BA02GL's packaging specification will follow the Portwell standard style.

Package	Appearance	Size
Anti-Static bubble bag		180x130mm
White Paper Box		210x150x40mm
Shipping Box (10 pcs White paper box)		595x300x185mm

Table 11 Packaging information

# 11 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/>

PICMG® COM Express Module™ Base Specification <http://www.picmg.org/>

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