



AXIOMTEK

SDM500L

**Intel® Smart Display Module (SDM-L)
with Intel® Core™ Whiskey Lake U
Processor**

User's Manual



Disclaimers

This manual has been carefully checked and believed to contain accurate information. Axiomtek Co., Ltd. assumes no responsibility for any infringements of patents or any third party's rights, and any liability arising from such use.

Axiomtek does not warrant or assume any legal liability or responsibility for the accuracy, completeness or usefulness of any information in this document. Axiomtek does not make any commitment to update the information in this manual.

Axiomtek reserves the right to change or revise this document and/or product at any time without notice.

No part of this document may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of Axiomtek Co., Ltd.

CAUTION

If you replace wrong batteries, it causes the danger of explosion. It is recommended by the manufacturer that you follow the manufacturer's instructions to only replace the same or equivalent type of battery, and dispose of used ones.

©Copyright 2020 Axiomtek Co., Ltd.

All Rights Reserved

May 2020, Version A1

Printed in Taiwan

ESD Precautions

Computer boards have integrated circuits sensitive to static electricity. To prevent chipsets from electrostatic discharge damage, please observe the following precautions:

- Do not remove modules or integrated circuits from their anti-static packaging until you are ready to install them.
- Before holding the module or any integrated circuit, touch an unpainted portion of the system unit chassis for a few seconds. Doing so will help discharge static electricity from your body.
- When handling modules and components, wear a wrist-grounding strap, available from most electronic component stores.

Trademarks Acknowledgments

Axiomtek is a trademark of Axiomtek Co., Ltd.

Windows[®] is a trademark of Microsoft Corporation.

AMI is a trademark of American Megatrend Inc.

IBM, PC/AT, PS/2, VGA are trademarks of International Business Machines Corporation.

Intel[®], Celeron[®] are trademarks of Intel Corporation.

Other brand names and trademarks are the properties and registered brands of their respective owners.

Table of Contents

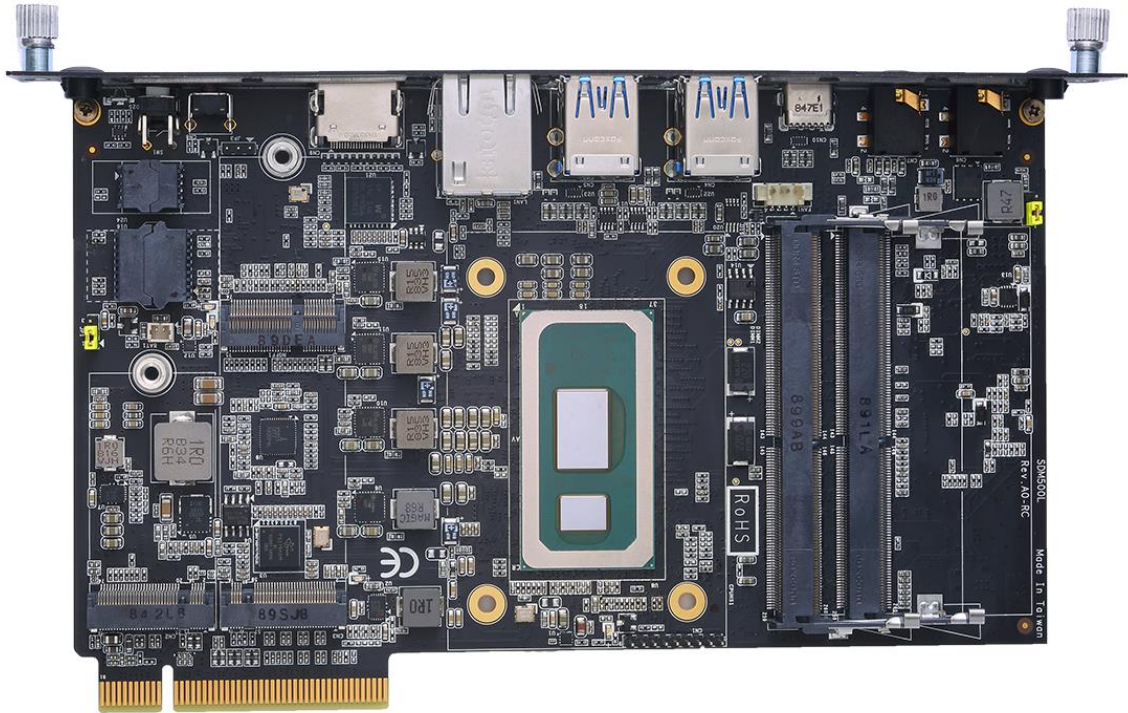
Disclaimers.....	ii
ESD Precautions.....	iii
Chapter 1 Introduction.....	1
1.1 Features.....	1
1.2 Specifications.....	2
1.3 Utilities Supported.....	3
Chapter 2 Module and Pin Assignments.....	5
2.1 Module Dimensions and Fixing Holes.....	5
2.2 Module Layout.....	7
2.3 Jumper Settings.....	8
2.3.1 Clear CMOS (JP1).....	8
2.3.2 Auto Power on (JP2).....	8
2.4 Connectors.....	9
2.4.1 Ethernet Port (LAN1).....	9
2.4.2 M.2 B Key 2242 Socket (CN2).....	10
2.4.3 M.2 M Key 2280 Socket (CN3).....	11
2.4.4 USB 3.1 Gen1 Port Stacks (CN4 and CN5).....	12
2.4.5 Audio Jack Mic-in Connector (CN6).....	12
2.4.6 Audio Jack Line-out Connector (CN7).....	13
2.4.7 Reset button (CN8).....	13
2.4.8 HDMI Connector (eDP) (CN9).....	13
2.4.9 Power State indicator LED (D25).....	13
2.4.10 M.2 E KEY Connector (NGFF1).....	14
2.4.11 Power On/Off button (SW1).....	14
2.4.12 SDM Edge Connector (J1).....	15
Chapter 3 Hardware Description.....	17
3.1 Microprocessor.....	17
3.2 BIOS.....	17
3.3 System Memory.....	17
3.4 I/O Port Address Map.....	18
3.5 Interrupt Controller (IRQ) Map.....	19
3.6 Memory Map.....	24

Chapter 4	AMI BIOS Setup Utility	25
4.1	Starting.....	25
4.2	Navigation Keys	25
4.3	Main Menu.....	27
4.4	Advanced Menu.....	28
4.5	Chipset Menu.....	34
4.6	Security Menu.....	36
4.7	Boot Menu.....	37
4.8	Save & Exit Menu	38
Appendix A	Watchdog Timer.....	41
A.1	About Watchdog Timer	41
A.2	How to Use Watchdog Timer	41

This page is intentionally left blank.

Chapter 1

Introduction



The SDM500L is a new Intel® Smart Display Module (SDM-L) supporting the Intel® Core™ Whiskey Lake U processor. It delivers outstanding system performance and supports a diverse range of multiple I/Os such as one Gigabyte Ethernet port, four USB 3.0 ports and one HDMI. The SDM500L measures only 100 x 175mm and delivers 4K output with streaming content through the SDM edge connector.

The SDM500L reserves two SO-DIMM slots, three types of M.2 sockets, plus one standard PCIe x8 (through the SDM edge connector). It also features built-in I/O interfaces including USB 3.0, HDMI 1.4, DisplayPort 1.2, Serial TX/RX and I²C. In addition, for maximum integration flexibility, the SDM500L can be built in or externally plugged into a display, which allows this cost-effective smart display module to fit into even the sleekest all-in-one designs.

1.1 Features

- Intel® Core™ Whiskey Lake U processor
- Two SO-DIMM memory slots supporting memory capacity up to 32GB
- One M.2 E Key 2230 for WiFi/BT, One M.2 B Key and One M.2 M key for storage options
- Four USB 3.0 ports and one GbE LAN port
- Easily integrates into slim designs

1.2 Specifications

- **CPU**
 - Intel® Core i3/i5/i7 Celeron® processor
 - Intel® Core™ i5-8265U Processor
 - Intel® Core™ i3-8145U Processor
 - Intel® Celeron® Processor 4305UE
- **BIOS**
 - American Megatrends Inc. BIOS.
 - 64Mbit SPI Flash, DMI, Plug and Play.
 - PXE Ethernet Boot ROM; customized default saving features; LPC-free supported; uses SPI type Flash memory.
- **System Memory**
 - Two SO-DIMM DDR4-2400MHz memory slots, supporting maximum capacity up to 32GB (optional).
- **Expansion Interface**
 - One M.2 E Key 2230 socket for Wi-Fi/Bluetooth option.
 - One M.2 B Key 2242 socket for storage
 - One M.2 M Key 2280 socket for storage
- **USB Interface**
 - Four USB 3.0 ports in Type A on the rear I/O.
 - One USB 3.0 port (through SDM edge connector).
- **Graphics**
 - Integrated in processor UHD graphics 610.
 - One DP 1.2 (through SDM edge connector), with resolution up to 4096x2160.
 - One HDMI 2.0 (through SDM edge connector), with resolution up to 3840x2160
 - One HDMI 1.4 (4096 x 2160 @ 30p) (rear I/O), no voice, no support hot pluggable
- **Ethernet**
 - One 1000/100/10 Base-T provided by Intel® I211AT with integrated boot ROM.
- **WatchDog Timer**
 - Timeout value range is 1~255 sec/min.
- **SDM Edge Connector**
 - 98-pin golden finger, supporting DP, HDMI, PCI Express x1, USB 3.0, Serial TX/RX, I²C and SPI.
- **Power Management**
 - ACPI (Advanced Configuration and Power Interface).
- **Form Factor**
 - 175mm x 60mm.

1.3 Utilities Supported

- Chipset driver
- Graphics driver
- TXE driver
- Serial IO driver
- Ethernet utility and driver



Note

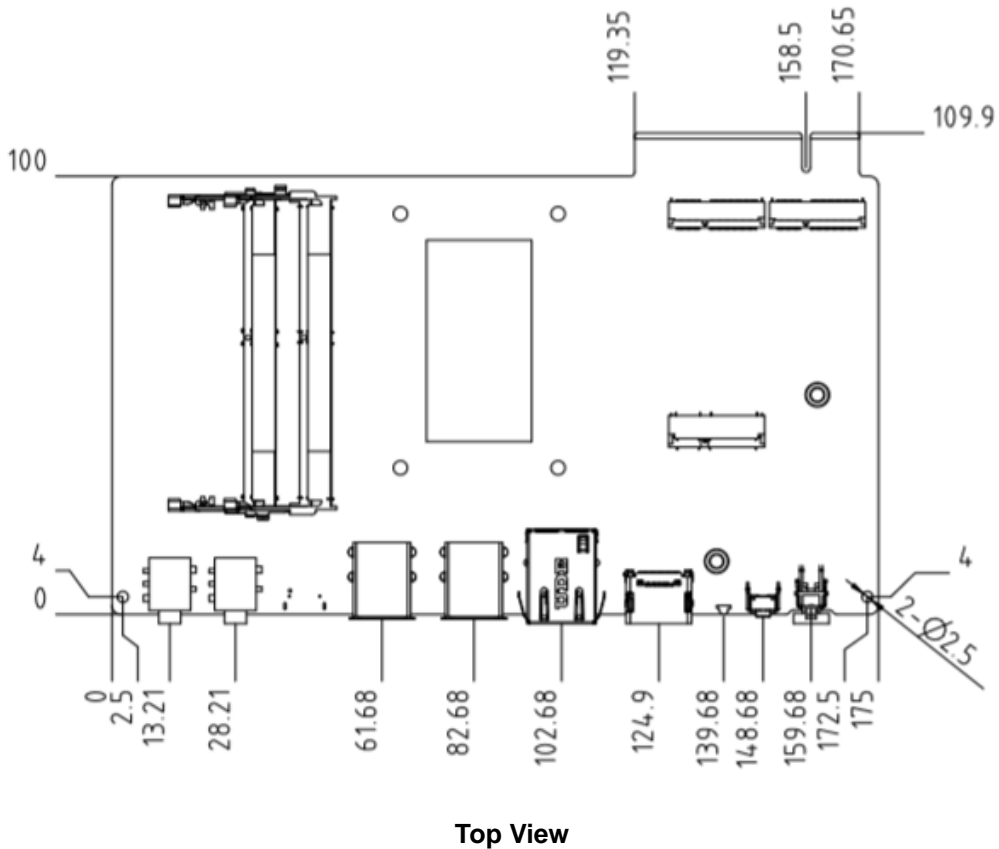
All specifications and images are subject to change without notice.

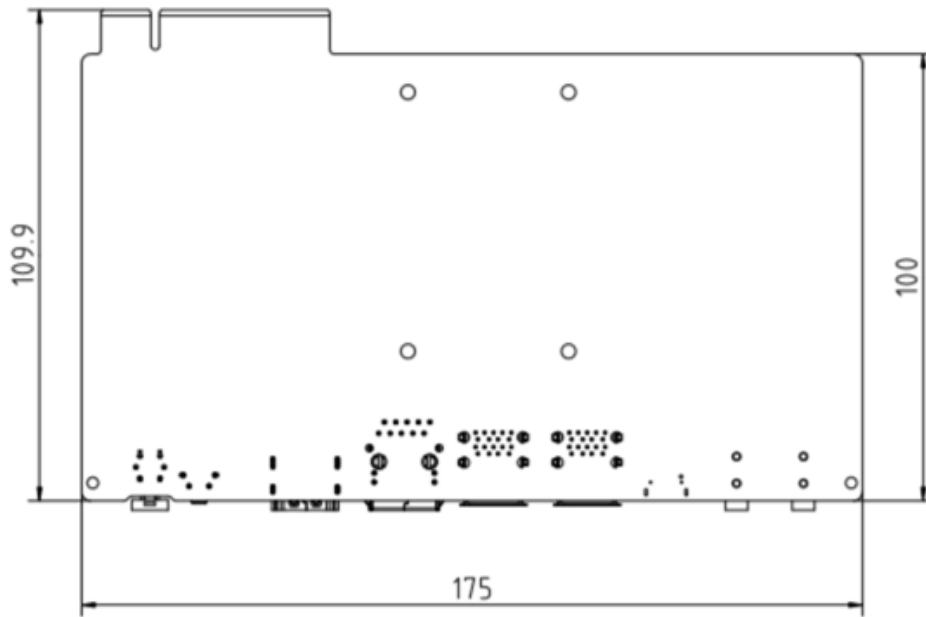
This page is intentionally left blank.

Chapter 2

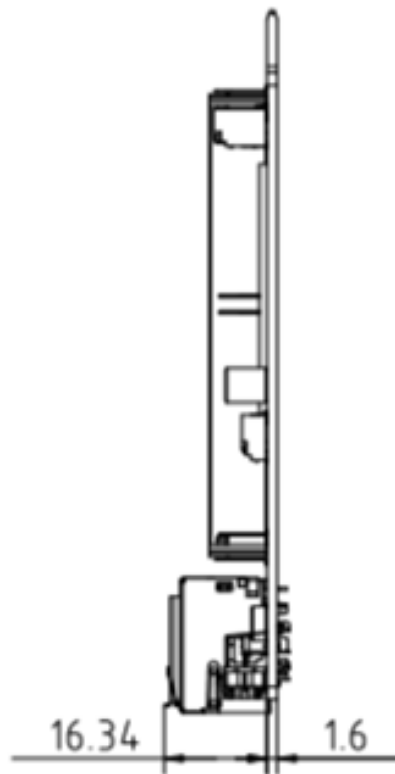
Module and Pin Assignments

2.1 Module Dimensions and Fixing Holes



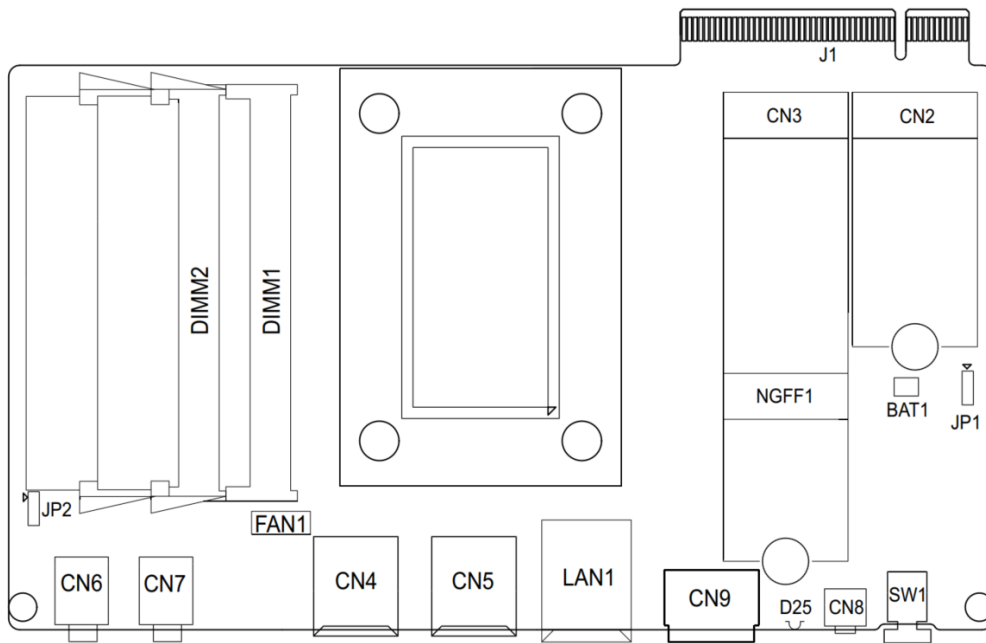


Bottom View

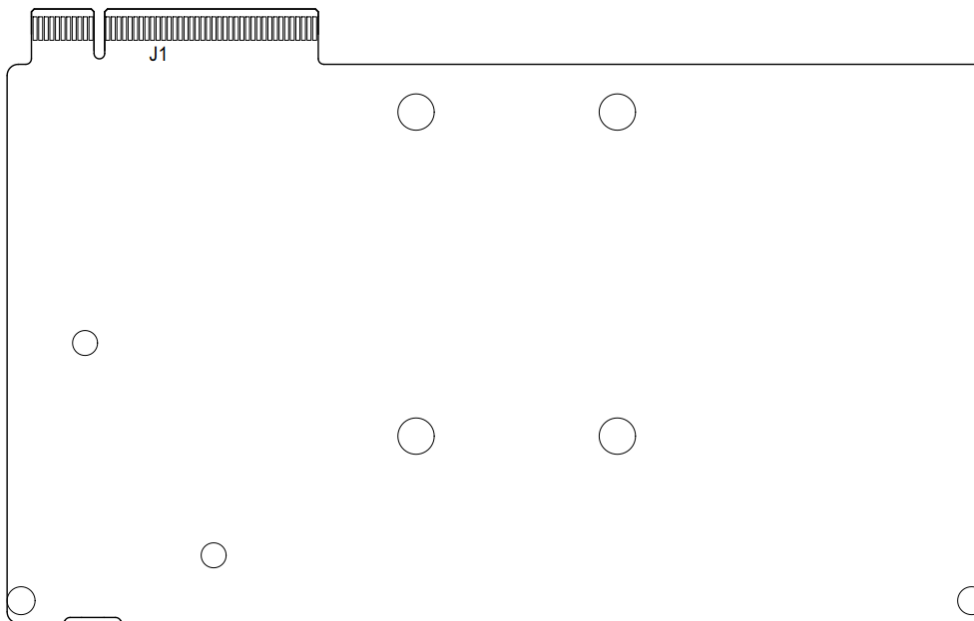


Side View

2.2 Module Layout



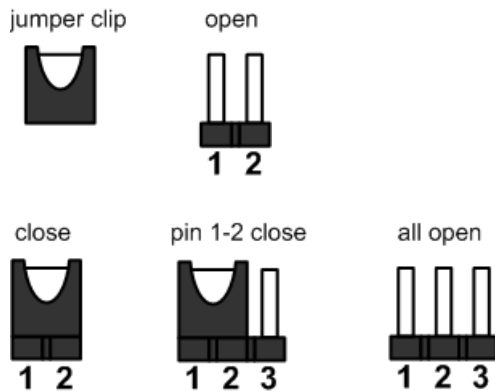
Top View



Bottom View

2.3 Jumper Settings

A jumper is a small component consisting of a set of jumper pins with a jumper clip. Place a jumper clip on two jumper pins to close; remove a jumper clip from two jumper pins to open. The following illustration shows how to set up a jumper.



Properly configure jumper settings on the SDM300S to meet your application purpose. Below you can find a summary table of jumpers and their default onboard settings.



Note

Once the default jumper setting needs to be changed, please do it under power-off condition.

Jumper	Description	Setting
JP1	Clear CMOS	1-2 : Normal (Default) 2-3 : Clear CMOS

2.3.1 Clear CMOS (JP1)

To restore BIOS optimal defaults, put the jumper clip on pin 2-3 for a few seconds then move it back to pin 1-2.

Function	Setting
Normal (Default)	1-2 Normal
Clear CMOS	2-3 Clear CMOS



2.3.2 Auto Power on (JP2)

If JP2 is enabled for power input, the system will be automatically power on without the need to press the soft power button. If JP1 is disabled for power input, it is necessary to manually press the soft power button to power on the system.

Function	Setting
Enable auto power on (Default)	1-2 close
Disable auto power on	2-3 close



2.4 Connectors

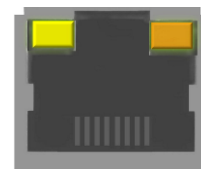
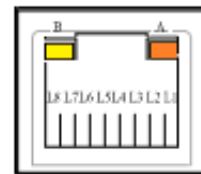
Signals go to the other parts of the system through connectors. Loose or improper connection might cause problems. Please make sure all connectors are properly and firmly connected. Here is a table summarizing the connectors on the hardware.

Connector	Description
GbE Lan port (RJ45)	LAN1
M.2 Key B socket	CN2
M.2 Key M socket	CN3
USB3.1 Gen1 Type A stack connector	CN4
USB3.1 Gen1 Type A stack connector	CN5
Audio Jack (MIC In)	CN6
Audio Jack (Line Out)	CN7
Reset Button	CN8
HDMI Type A (eDP)	CN9
Battery header	BAT1
M.2 Key E socket	NGFF1
Power button	SW1
FAN header	FAN1
SDM edge connector	J1
Type C connector	Will be removed

2.4.1 Ethernet Port (LAN1)

The board has one RJ-45 Ethernet connector (LAN1). Connection can be established by plugging one end of the Ethernet cable into this RJ-45 connector and the other end (phone jack) to a 1000/100/10-Base-T hub.

Pin	1000 Base-T
L1	MDI0+
L2	MDI0-
L3	MDI1+
L4	MDI1-
L5	MDI2+
L6	MDI2-
L7	MDI3+
L8	MDI3-
A	Active Link LED (Yellow) Off: No link Blinking: Data activity detected
B	Speed LED 1000: Orange 100/10: Green/OFF



2.4.2 M.2 B Key 2242 Socket (CN2)

The module has one M.2 E Key 2230 socket on the top side supporting PCI Express x1 and USB 2.0.

Pin	Signal	Pin	Signal
1	CONFIG_3	2	+3.3V
3	GND	4	+3.3V
5	GND	6	FULL_CARD_POWER_OFF
7	USB_D+	8	W_DISABLE1#
9	USB_D-	10	NC
11	GND	12	NC
13	NC	14	NC
15	NC	16	NC
17	NC	18	NC
19	NC	20	NC
21	CONFIG_0	22	NC
23	GPIO_11	24	NC
25	NC	26	NC
27	GND	28	NC
29	PERn1	30	NC
31	PERp1	32	NC
33	GND	34	NC
35	PETn1	36	NC
37	PETp1	38	DEVSLP
39	GND	40	GPIO_0(I/O)
41	PERn0/SATA-B+	42	GPIO_1(I/O)
43	PERp0/SATA-B-	44	GPIO_2(I/O)
45	GND	46	NC
47	PETn0/SATA-A-	48	NC
49	PETp0/SATA-A+	50	PERST#
51	GND	52	CLKREQ#
53	REFCLKN	54	PEWAKE#
55	REFCLKP	56	N/C_56
57	GND	58	N/C_58
59	NC	60	COEX3
61	NC	62	COEX2
63	NC	64	COEX1
65	NC	66	SIM DETECT
67	RESET#	68	SUSCLK(32kHz)
69	CONFIG_1	70	+3.3V
71	GND	72	+3.3V
73	GND	74	+3.3V
75	CONFIG_2		

2.4.3 M.2 M Key 2280 Socket (CN3)

This system has one M.2 M key socket for inserting the M.2 2280 NVMe / SATA SSD module.

Pin	Signal	Pin	Signal
1	GND	2	+3.3V
3	GND	4	+3.3V
5	PERn3	6	NC
7	PERp3	8	NC
9	GND	10	LED1#
11	PETn3	12	+3.3V
13	PETp3	14	+3.3V
15	GND	16	+3.3V
17	PERn2	18	+3.3 V
19	PERp2	20	NC
21	GND	22	NC
23	PETn2	24	NC
25	PETp2	26	NC
27	GND	28	NC
29	PERn1	30	NC
31	PERp1	32	NC
33	GND	34	NC
35	PETn1	36	NC
37	PETp1	38	DEVSLP
39	GND	40	NC
41	SATA_RXP /PERn0	42	NC
43	SATA_RXN /PERp0	44	NC
45	GND	46	NC
47	SATA_TXN /PETn0	48	NC
49	SATA_TXP /PETp0	50	PERST#
51	GND	52	CLKREQ#
53	REFCLKN	54	PEWAKE#
55	REFCLKP	56	NC
57	GND	58	NC
59	NC	60	NC
61	NC	62	NC
63	NC	64	NC
65	NC	66	NC
67	NC	68	NC
69	PEDET	70	+3.3V
71	GND	72	+3.3V
73	GND	74	+3.3V
75	GND		

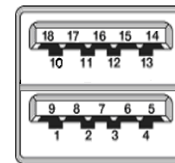
2.4.4 USB 3.1 Gen1 Port Stacks (CN4 and CN5)

The Universal Serial Bus (compliant with USB 3.1 Gen1 (5Gb/s)) connectors are on the rear I/O side. It is commonly used for installing USB peripherals such as a keyboard, mouse, scanner, etc.

The CN4 carries USB port 3 and 4 signals

Pin	Signal	Pin	Signal
1	USB_VCC (+5V_SBY)	10	USB_VCC (+5V_SBY)
2	USB_Data3-	11	USB_Data4-
3	USB_Data3+	12	USB_Data4+
4	GND	13	GND
5	SSRX3-	14	SSRX4-
6	SSRX3+	15	SSRX4+
7	GND	16	GND
8	SSTX3-	17	SSTX4-
9	SSTX3+	18	SSTX4+

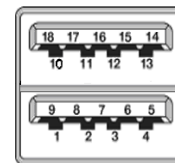
CN4



The CN5 carries USB port 1 and 2 signals

Pin	Signal	Pin	Signal
1	USB_VCC (+5V_SBY)	10	USB_VCC (+5V_SBY)
2	USB_Data1-	11	USB_Data2-
3	USB_Data1+	12	USB_Data2+
4	GND	13	GND
5	SSRX1-	14	SSRX2-
6	SSRX1+	15	SSRX2+
7	GND	16	GND
8	SSTX1-	17	SSTX2-
9	SSTX1+	18	SSTX2+

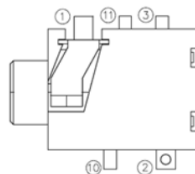
CN5



2.4.5 Audio Jack Mic-in Connector (CN6)

The system provides one HD audio jack Mic-in connector.

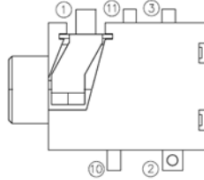
Pin	Setting
1	GND
2	MIC_L
3	MIC_R
10	NC
11	NC



2.4.6 Audio Jack Line-out Connector (CN7)

The system provides one HD audio jack Line_out connector.

Pin	Setting
1	GND
2	LINEOUT_L
3	LINEOUT_R
10	NC
11	NC



2.4.7 Reset button (CN8)

The Reset button allows users to reset the system when an abnormal situation occurs during system operation.

Function	Description
On	Reset system
Off	Keep system status

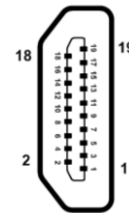
Reset



2.4.8 HDMI Connector (eDP) (CN9)

The HDMI (High-Definition Multimedia Interface) is an eDP interface source that requires the single cable to be inserted before booting the system and does not support audio.

Pin	Signal	Pin	Signal
1	HDMI OUT_DATA2+	2	GND
3	HDMI OUT_DATA2-	4	HDMI OUT_DATA1+
5	GND	6	HDMI OUT_DATA1-
7	HDMI OUT_DATA0+	8	GND
9	HDMI OUT_DATA0-	10	HDMI OUT_Clock+
11	GND	12	HDMI OUT_Clock-
13	N.C.	14	N.C.
15	HDMI OUT_SCL	16	HDMI OUT_SDA
17	GND	18	+5V
19	HDMI_HTPLG		



2.4.9 Power State indicator LED (D25)

The Power State indicator LED is on the I/O side. It can allow users to identify the state of the system.

LED color	System state
Green	Power ON
Red	Sleep / Shutdown

2.4.10 M.2 E KEY Connector (NGFF1)

The system has one M.2 E Key 2230 socket on the top side supporting PCI Express x1 / CNVi and USB 2.0.

Pin	Signal	Pin	Signal
1	GND	2	+3.3V
3	USB_D+	4	+3.3V
5	USB_D-	6	LED1#
7	GND	8	I2S SCK
9	CNV_WR_LANE1_DN	10	I2S WS
11	CNV_WR_LANE1_DP	12	I2S SD_IN
13	GND	14	I2S SD_OUT
15	CNV_WR_LANE0_DN	16	LED2#
17	CNV_WR_LANE0_DP	18	GND
19	GND	20	UART WAKE#
21	CNV_WR_CLK_DN	22	BRI_RSP
23	CNV_WR_CLK_DP	24	NC
25	NC	26	NC
27	NC	28	NC
29	NC	30	NC
31	NC	32	RGI_DT
33	GND	34	RGI_RSP
35	PETp0	36	BRI_DT
37	PETn0	38	CLINK RESET
39	GND	40	CLINK DATA
41	PERp0	42	CLINK CLK
43	PERn0	44	COEX3
45	GND	46	COEX2
47	REFCLKP0	48	COEX1
49	REFCLKN0	50	SUSCLK (32kHz)
51	GND	52	PERST0#
53	CLKREQ0#	54	W_DISABLE2#
55	PEWAKE0#	56	W_DISABLE1#
57	GND	58	NC
59	CNV_WT_LANE1_DN	60	NC
61	CNV_WT_LANE1_DP	62	NC
63	GND	64	REFCLK0
65	CNV_WT_LANE0_DN	66	PERST1#
67	CNV_WT_LANE0_DP	68	NC
69	GND	70	NC
71	CNV_WT_CLK_DN	72	+3.3V
73	CNV_WT_CLK_DP	74	+3.3V
75	GND		

2.4.11 Power On/Off button (SW1)

The power button is on the I/O side. It allows users to control system power on/off.

Power Button	Description
On	Turn on/off system
Off	Keep system status



2.4.12 SDM Edge Connector (J1)

The following table shows pin assignments of the 98-pin SDM PCIe8 edge connector.

Pin	Side B (Top)	Pin	Side A (Bottom)
1	+12V	1	+12V
2	+12V	2	+12V
3	+3.3VSB	3	+12V
4	GND	4	GND
5	GND	5	GND
6	PWRBTN#	6	PWRGD#
7	RESET#	7	SLP_S4
8	SYSFAN#	8	SDM_DET#
9	GND	9	CEC/NC
10	I2C1_SDA	10	I2C0_SDA
11	I2C1_SCL	11	I2C0_SCL
12	GSPI_MOSI	12	GSPI_CLK
13	GSPI_MISO	13	GSPI_CS0#
14	GND	14	GND
15	UART_TXD	15	PCIe_TX+
16	UART_RXD	16	PCIe_TX-
17	GND	17	GND
18	USB_SSTX+	18	PCIe_RX+
19	USB_SSTX-	19	PCIe_RX-
20	GND	20	GND
21	USB_SSRX+	21	PCIe_Clk+
22	USB_SSRX-	22	PCIe_Clk-
23	GND	23	GND
24	USB+	24	PCIE_WAKE#
25	USB-	25	PCIE_CLKREQ#
26	USB_OC#	26	PCIE_RST#
27	GND	27	GND
28	DP3-	28	TMDS_CLK-
29	DP3+	29	TMDS_CLK+
30	GND	30	GND
31	DP2-	31	TMDS0-
32	DP2+	32	TMDS0+
33	GND	33	GND
34	DP1-	34	TMDS1-
35	DP1+	35	TMDS1+
36	GND	36	GND
37	DP0-	37	TMDS2-
38	DP0+	38	TMDS2+
39	GND	39	GND
40	DP_AUX-	40	DDC_DATA
41	DP_AUX+	41	DDC_CLK
42	DP_HPD	42	TMDS_HPD
43	GND	43	GND
44	RSVD	44	RSVD
45	RSVD	45	RSVD
46	RSVD	46	RSVD
47	RSVD	47	RSVD
48	RSVD	48	RSVD
49	RSVD	49	RSVD

This page is intentionally left blank.

Chapter 3

Hardware Description

3.1 Microprocessor

The SMD500L supports Intel® Core™ i3-8145U / i5-8265U and Celeron® 4305UE processors, which enable your system to operate under Windows® 10 and Linux environments. The system performance depends on the microprocessor. Make sure all correct settings are arranged for the installed microprocessor to prevent the CPU from damage.

3.2 BIOS

The SDM500L uses AMI Plug and Play BIOS with a single 256Mbit SPI Flash.

3.3 System Memory

Two 260-pin DDR4-2400 SO-DIMM slots, up to 32GB at the maximum.

3.4 I/O Port Address Map




















































The I/O port address mapping list is shown as follows:

Address Range	Device Name
[0000000000000000 - 00000000000000CF7]	PCI Express Root Complex
[0000000000000020 - 0000000000000021]	Programmable interrupt controller
[0000000000000024 - 0000000000000025]	Programmable interrupt controller
[0000000000000028 - 0000000000000029]	Programmable interrupt controller
[000000000000002C - 000000000000002D]	Programmable interrupt controller
[000000000000002E - 000000000000002F]	Motherboard resources
[0000000000000030 - 0000000000000031]	Programmable interrupt controller
[0000000000000034 - 0000000000000035]	Programmable interrupt controller
[0000000000000038 - 0000000000000039]	Programmable interrupt controller
[000000000000003C - 000000000000003D]	Programmable interrupt controller
[0000000000000040 - 0000000000000043]	System timer
[000000000000004E - 000000000000004F]	Motherboard resources
[0000000000000050 - 0000000000000053]	System timer
[0000000000000061 - 0000000000000061]	Motherboard resources
[0000000000000063 - 0000000000000063]	Motherboard resources
[0000000000000065 - 0000000000000065]	Motherboard resources
[0000000000000067 - 0000000000000067]	Motherboard resources
[0000000000000070 - 0000000000000070]	Motherboard resources
[0000000000000080 - 0000000000000080]	Motherboard resources
[0000000000000092 - 0000000000000092]	Motherboard resources
[00000000000000A0 - 00000000000000A1]	Programmable interrupt controller
[00000000000000A4 - 00000000000000A5]	Programmable interrupt controller
[00000000000000A8 - 00000000000000A9]	Programmable interrupt controller
[00000000000000AC - 00000000000000AD]	Programmable interrupt controller
[00000000000000B0 - 00000000000000B1]	Programmable interrupt controller
[00000000000000B2 - 00000000000000B3]	Motherboard resources
[00000000000000B4 - 00000000000000B5]	Programmable interrupt controller
[00000000000000B8 - 00000000000000B9]	Programmable interrupt controller
[00000000000000BC - 00000000000000BD]	Programmable interrupt controller
[0000000000000280 - 000000000000028F]	Motherboard resources
[0000000000000290 - 000000000000029F]	Motherboard resources
[00000000000002A0 - 00000000000002AF]	Motherboard resources
[00000000000002B0 - 00000000000002BF]	Motherboard resources
[00000000000002F8 - 00000000000002FF]	Communications Port (COM2)
[00000000000003B0 - 00000000000003BB]	Intel(R) UHD Graphics 620
[00000000000003C0 - 00000000000003DF]	Intel(R) UHD Graphics 620
[00000000000003F8 - 00000000000003FF]	Communications Port (COM1)
[00000000000004D0 - 00000000000004D1]	Programmable interrupt controller
[0000000000000680 - 000000000000069F]	Motherboard resources
[0000000000000D00 - 0000000000000FFF]	PCI Express Root Complex
[000000000000164E - 000000000000164F]	Motherboard resources
[0000000000001800 - 00000000000018FE]	Motherboard resources
[0000000000001854 - 0000000000001857]	Motherboard resources
[0000000000002000 - 00000000000020FE]	Motherboard resources
[0000000000003000 - 000000000000303F]	Intel(R) UHD Graphics 610
[0000000000003000 - 000000000000303F]	Intel(R) UHD Graphics 620
[0000000000003060 - 000000000000307F]	Standard SATA AHCI Controller
[0000000000003080 - 0000000000003083]	Standard SATA AHCI Controller
[0000000000003090 - 0000000000003097]	Standard SATA AHCI Controller
[000000000000EFA0 - 000000000000EFBF]	Intel(R) SMBus - 9DA3

3.5 Interrupt Controller (IRQ) Map

The interrupt controller (IRQ) mapping list is shown as follows:

▼	Interrupt request (IRQ)	
	(ISA) 0x00000000 (00)	System timer
	(ISA) 0x00000003 (03)	Communications Port (COM2)
	(ISA) 0x00000004 (04)	Communications Port (COM1)
	(ISA) 0x0000000B (11)	Intel(R) UHD Graphics 610
	(ISA) 0x0000000B (11)	Intel(R) Wireless-AC 9560
	(ISA) 0x0000000B (11)	Standard SATA AHCI Controller
	(ISA) 0x0000000E (14)	Intel(R) Serial IO GPIO Host Controller - INT34BB
	(ISA) 0x00000037 (55)	Microsoft ACPI-Compliant System
	(ISA) 0x00000038 (56)	Microsoft ACPI-Compliant System
	(ISA) 0x00000039 (57)	Microsoft ACPI-Compliant System
	(ISA) 0x0000003A (58)	Microsoft ACPI-Compliant System
	(ISA) 0x0000003B (59)	Microsoft ACPI-Compliant System
	(ISA) 0x0000003C (60)	Microsoft ACPI-Compliant System
	(ISA) 0x0000003D (61)	Microsoft ACPI-Compliant System
	(ISA) 0x0000003E (62)	Microsoft ACPI-Compliant System
	(ISA) 0x0000003F (63)	Microsoft ACPI-Compliant System
	(ISA) 0x00000040 (64)	Microsoft ACPI-Compliant System
	(ISA) 0x00000041 (65)	Microsoft ACPI-Compliant System
	(ISA) 0x00000042 (66)	Microsoft ACPI-Compliant System
	(ISA) 0x00000043 (67)	Microsoft ACPI-Compliant System
	(ISA) 0x00000044 (68)	Microsoft ACPI-Compliant System
	(ISA) 0x00000045 (69)	Microsoft ACPI-Compliant System
	(ISA) 0x00000046 (70)	Microsoft ACPI-Compliant System
	(ISA) 0x00000047 (71)	Microsoft ACPI-Compliant System
	(ISA) 0x00000048 (72)	Microsoft ACPI-Compliant System
	(ISA) 0x00000049 (73)	Microsoft ACPI-Compliant System
	(ISA) 0x0000004A (74)	Microsoft ACPI-Compliant System
	(ISA) 0x0000004B (75)	Microsoft ACPI-Compliant System
	(ISA) 0x0000004C (76)	Microsoft ACPI-Compliant System
	(ISA) 0x0000004D (77)	Microsoft ACPI-Compliant System
	(ISA) 0x0000004E (78)	Microsoft ACPI-Compliant System
	(ISA) 0x0000004F (79)	Microsoft ACPI-Compliant System
	(ISA) 0x00000050 (80)	Microsoft ACPI-Compliant System
	(ISA) 0x00000051 (81)	Microsoft ACPI-Compliant System
	(ISA) 0x00000052 (82)	Microsoft ACPI-Compliant System
	(ISA) 0x00000053 (83)	Microsoft ACPI-Compliant System
	(ISA) 0x00000054 (84)	Microsoft ACPI-Compliant System
	(ISA) 0x00000055 (85)	Microsoft ACPI-Compliant System
	(ISA) 0x00000056 (86)	Microsoft ACPI-Compliant System
	(ISA) 0x00000057 (87)	Microsoft ACPI-Compliant System
	(ISA) 0x00000058 (88)	Microsoft ACPI-Compliant System
	(ISA) 0x00000059 (89)	Microsoft ACPI-Compliant System
	(ISA) 0x0000005A (90)	Microsoft ACPI-Compliant System
	(ISA) 0x0000005B (91)	Microsoft ACPI-Compliant System
	(ISA) 0x0000005C (92)	Microsoft ACPI-Compliant System
	(ISA) 0x0000005D (93)	Microsoft ACPI-Compliant System
	(ISA) 0x0000005E (94)	Microsoft ACPI-Compliant System
	(ISA) 0x0000005F (95)	Microsoft ACPI-Compliant System
	(ISA) 0x00000060 (96)	Microsoft ACPI-Compliant System
	(ISA) 0x00000061 (97)	Microsoft ACPI-Compliant System

 (ISA) 0x000001C7 (455)	Microsoft ACPI-Compliant System
 (ISA) 0x000001C8 (456)	Microsoft ACPI-Compliant System
 (ISA) 0x000001C9 (457)	Microsoft ACPI-Compliant System
 (ISA) 0x000001CA (458)	Microsoft ACPI-Compliant System
 (ISA) 0x000001CB (459)	Microsoft ACPI-Compliant System
 (ISA) 0x000001CC (460)	Microsoft ACPI-Compliant System
 (ISA) 0x000001CD (461)	Microsoft ACPI-Compliant System
 (ISA) 0x000001CE (462)	Microsoft ACPI-Compliant System
 (ISA) 0x000001CF (463)	Microsoft ACPI-Compliant System
 (ISA) 0x000001D0 (464)	Microsoft ACPI-Compliant System
 (ISA) 0x000001D1 (465)	Microsoft ACPI-Compliant System
 (ISA) 0x000001D2 (466)	Microsoft ACPI-Compliant System
 (ISA) 0x000001D3 (467)	Microsoft ACPI-Compliant System
 (ISA) 0x000001D4 (468)	Microsoft ACPI-Compliant System
 (ISA) 0x000001D5 (469)	Microsoft ACPI-Compliant System
 (ISA) 0x000001D6 (470)	Microsoft ACPI-Compliant System
 (ISA) 0x000001D7 (471)	Microsoft ACPI-Compliant System
 (ISA) 0x000001D8 (472)	Microsoft ACPI-Compliant System
 (ISA) 0x000001D9 (473)	Microsoft ACPI-Compliant System
 (ISA) 0x000001DA (474)	Microsoft ACPI-Compliant System
 (ISA) 0x000001DB (475)	Microsoft ACPI-Compliant System
 (ISA) 0x000001DC (476)	Microsoft ACPI-Compliant System
 (ISA) 0x000001DD (477)	Microsoft ACPI-Compliant System
 (ISA) 0x000001DE (478)	Microsoft ACPI-Compliant System
 (ISA) 0x000001DF (479)	Microsoft ACPI-Compliant System
 (ISA) 0x000001E0 (480)	Microsoft ACPI-Compliant System
 (ISA) 0x000001E1 (481)	Microsoft ACPI-Compliant System
 (ISA) 0x000001E2 (482)	Microsoft ACPI-Compliant System
 (ISA) 0x000001E3 (483)	Microsoft ACPI-Compliant System
 (ISA) 0x000001E4 (484)	Microsoft ACPI-Compliant System
 (ISA) 0x000001E5 (485)	Microsoft ACPI-Compliant System
 (ISA) 0x000001E6 (486)	Microsoft ACPI-Compliant System
 (ISA) 0x000001E7 (487)	Microsoft ACPI-Compliant System
 (ISA) 0x000001E8 (488)	Microsoft ACPI-Compliant System
 (ISA) 0x000001E9 (489)	Microsoft ACPI-Compliant System
 (ISA) 0x000001EA (490)	Microsoft ACPI-Compliant System
 (ISA) 0x000001EB (491)	Microsoft ACPI-Compliant System
 (ISA) 0x000001EC (492)	Microsoft ACPI-Compliant System
 (ISA) 0x000001ED (493)	Microsoft ACPI-Compliant System
 (ISA) 0x000001EE (494)	Microsoft ACPI-Compliant System
 (ISA) 0x000001EF (495)	Microsoft ACPI-Compliant System
 (ISA) 0x000001F0 (496)	Microsoft ACPI-Compliant System
 (ISA) 0x000001F1 (497)	Microsoft ACPI-Compliant System
 (ISA) 0x000001F2 (498)	Microsoft ACPI-Compliant System
 (ISA) 0x000001F3 (499)	Microsoft ACPI-Compliant System
 (ISA) 0x000001F4 (500)	Microsoft ACPI-Compliant System
 (ISA) 0x000001F5 (501)	Microsoft ACPI-Compliant System
 (ISA) 0x000001F6 (502)	Microsoft ACPI-Compliant System
 (ISA) 0x000001F7 (503)	Microsoft ACPI-Compliant System
 (ISA) 0x000001F8 (504)	Microsoft ACPI-Compliant System
 (ISA) 0x000001F9 (505)	Microsoft ACPI-Compliant System

3.6 Memory Map

The memory mapping list is shown as follows:

▼	Memory	
	[0000000000A0000 - 0000000000BFFFF]	Intel(R) UHD Graphics 620
	[0000000000A0000 - 0000000000BFFFF]	PCI Express Root Complex
	[0000000040000000 - 00000000403FFFF]	Motherboard resources
	[0000000090000000 - 000000009FFFFFF]	Intel(R) UHD Graphics 610
	[0000000090000000 - 000000009FFFFFF]	Intel(R) UHD Graphics 620
	[0000000090000000 - 00000000DFFFFFF]	PCI Express Root Complex
	[00000000A0000000 - 00000000A0FFFFFF]	Intel(R) UHD Graphics 610
	[00000000A0000000 - 00000000A0FFFFFF]	Intel(R) UHD Graphics 620
	[00000000A1000000 - 00000000A10FFFF]	High Definition Audio Controller
	[00000000A1100000 - 00000000A1103FFF]	Standard NVM Express Controller
	[00000000A1100000 - 00000000A11FFFFFF]	Intel(R) PCI Express Root Port #13 - 9DB4
	[00000000A1200000 - 00000000A121FFFF]	Intel(R) Ethernet Connection (6) I219-LM
	[00000000A1220000 - 00000000A122FFFF]	Intel(R) USB 3.1 eXtensible Host Controller - 1.10 (Microsoft)
	[00000000A1238000 - 00000000A123BFFF]	High Definition Audio Controller
	[00000000A123C000 - 00000000A123DFFF]	Standard SATA AHCI Controller
	[00000000A123C000 - 00000000A123FFFF]	Intel(R) Wireless-AC 9560
	[00000000A123E000 - 00000000A123E0FF]	Intel(R) SMBus - 9DA3
	[00000000A1241000 - 00000000A12417FF]	Standard SATA AHCI Controller
	[00000000A1242000 - 00000000A12420FF]	Standard SATA AHCI Controller
	[00000000E0000000 - 00000000EFFFFFF]	Motherboard resources
	[00000000FC800000 - 00000000FE7FFFF]	PCI Express Root Complex
	[00000000FD000000 - 00000000FD69FFF]	Motherboard resources
	[00000000FD6A0000 - 00000000FD6AFFFF]	Intel(R) Serial IO GPIO Host Controller - INT34BB
	[00000000FD6B0000 - 00000000FD6CFFF]	Motherboard resources
	[00000000FD6D0000 - 00000000FD6DFFFF]	Intel(R) Serial IO GPIO Host Controller - INT34BB
	[00000000FD6E0000 - 00000000FD6EFFFF]	Intel(R) Serial IO GPIO Host Controller - INT34BB
	[00000000FD6F0000 - 00000000FD6FFFF]	Motherboard resources
	[00000000FE000000 - 00000000FE01FFFF]	Motherboard resources
	[00000000FE010000 - 00000000FE010FFF]	Intel(R) SPI (flash) Controller - 9DA4
	[00000000FE1FD000 - 00000000FE1FDFFF]	Intel(R) Serial IO I2C Host Controller - 9DE8
	[00000000FE1FE000 - 00000000FE1FEFFF]	Intel(R) Serial IO I2C Host Controller - 9DE8
	[00000000FE1FF000 - 00000000FE1FFFFF]	Intel(R) Serial IO I2C Host Controller - 9DE9
	[00000000FE200000 - 00000000FE7FFFF]	Motherboard resources
	[00000000FED00000 - 00000000FED003FF]	High precision event timer
	[00000000FED10000 - 00000000FED17FFF]	Motherboard resources
	[00000000FED18000 - 00000000FED18FFF]	Motherboard resources
	[00000000FED19000 - 00000000FED19FFF]	Motherboard resources
	[00000000FED20000 - 00000000FED3FFFF]	Motherboard resources
	[00000000FED45000 - 00000000FED8FFFF]	Motherboard resources
	[00000000FED90000 - 00000000FED93FFF]	Motherboard resources
	[00000000FEE00000 - 00000000FEEFFFF]	Motherboard resources
	[00000000FF000000 - 00000000FFFFFF]	Motherboard resources

Chapter 4

AMI BIOS Setup Utility

The AMI UEFI BIOS provides users with a built-in setup program to modify basic system configuration. All configured parameters are stored in a flash chip to save the setup information whenever the power is turned off. This chapter provides users with detailed description about how to set up basic system configuration through the AMI BIOS setup utility.

4.1 Starting

To enter the setup screens, follow the steps below:

1. Turn on the computer and press the key immediately.
2. After you press the key, the main BIOS setup menu displays. You can access the other setup screens, such as the Advanced and Chipset menus, from the main BIOS setup menu.

It is strongly recommended that you should avoid changing the chipset's defaults. Both AMI and your system manufacturer have carefully set up these defaults that provide the best performance and reliability.

4.2 Navigation Keys

The BIOS setup/utility uses a key-based navigation system called hot keys. Most of the BIOS setup utility hot keys can be used at any time during the setup navigation process. These keys include <F1>, <F2>, <Enter>, <ESC>, <Arrow> keys, and so on.



Note

Some of the navigation keys differ from one screen to another.

Hot Keys	Description
→← Left/Right	The Left and Right <Arrow> keys allow you to select a setup screen.
↑↓ Up/Down	The Up and Down <Arrow> keys allow you to select a setup screen or sub-screen.
+– Plus/Minus	The Plus and Minus <Arrow> keys allow you to change the field value of a particular setup item.
Tab	The <Tab> key allows you to select setup fields.
F1	The <F1> key allows you to display the General Help screen.
F2	The <F2> key allows you to load previous values.
F3	The <F3> key allows you to load optimized defaults.
F4	The <F4> key allows you to save any changes you have made and exit Setup. Press the <F4> key to save your changes.
Esc	The <Esc> key allows you to discard any changes you have made and exit the Setup. Press the <Esc> key to exit the setup without saving your changes.
Enter	The <Enter> key allows you to display or change the setup option listed for a particular setup item. The <Enter> key can also allow you to display the setup sub-screens.

4.3 Main Menu

The Main BIOS setup screen is the first screen you see when entering the setup utility. You can always return to the Main BIOS setup screen by selecting the Main tab. System Time/Date can be set up as described below. The Main BIOS setup screen is also shown below.



BIOS Information

Display BIOS and EC firmware information.

System Date/Time

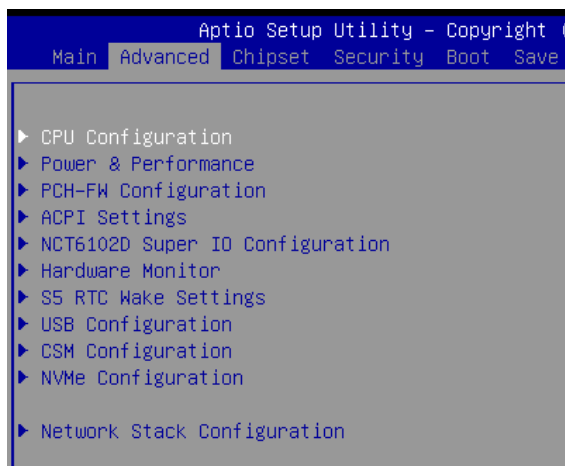
Use this option to change the system time and date. Highlight System Time or System Date using the <Arrow> keys. Enter new values through the keyboard. Press the <Tab> key or the <Arrow> keys to move between fields. The date must be entered in MM/DD/YY format. The time is entered in HH:MM:SS format.

4.4 Advanced Menu

The Advanced menu also allows users to set configuration of the CPU and other system devices. You can select any of the items in the left frame of the screen to go to the sub menus:

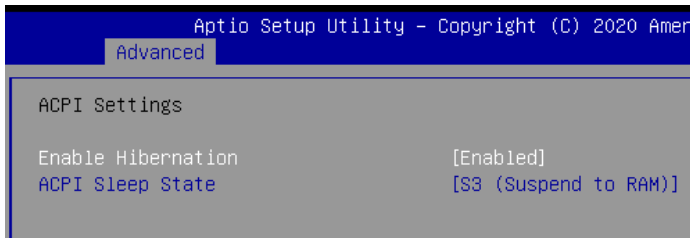
- ▶ ACPI Settings
- ▶ NCT6102D Super IO Configuration
- ▶ CPU Configuration
- ▶ Network Stack Configuration
- ▶ CSM Configuration
- ▶ USB Configuration

For items marked with “▶”, please press <Enter> for more options.



- **ACPI Settings**

You can use this menu to select options for system ACPI configuration, and then change the value of the selected option. A description of the selected item appears on the right side of the screen.



Enable Hibernation

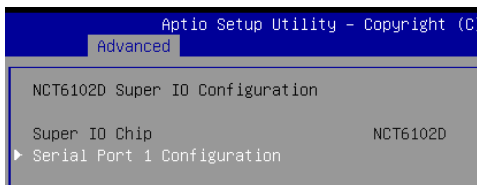
Enable or disable the system's ability to hibernate.

ACPI Sleep State

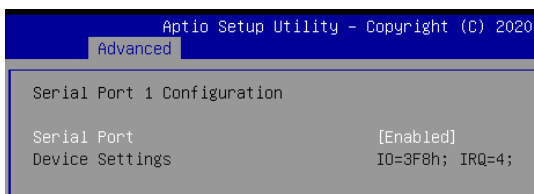
Select the ACPI (Advanced Configuration and Power Interface) sleep state. Configuration options are Suspend Disabled and S3 (Suspend to RAM). The S3 (Suspend to RAM) option selects ACPI sleep state the system will enter when suspend button is pressed.

- **NCT6102D Super IO Configuration**

You can use this screen to select options for the Serial Port Configuration, and then change the value of the selected option. A description of the selected item appears on the right side of the screen. For items marked with "▶", please press <Enter> for more options.



- **Serial Port 1 Configuration**

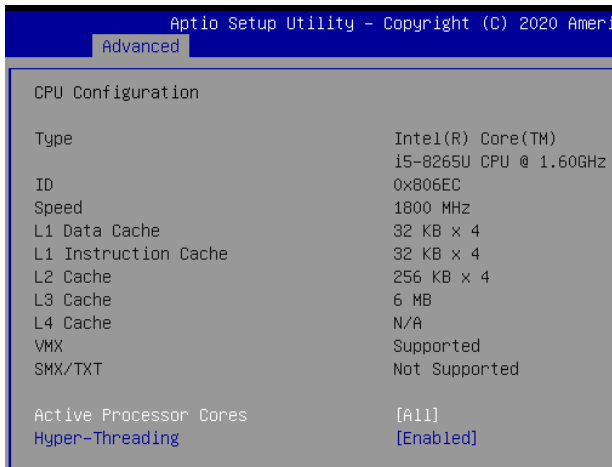


Serial Port

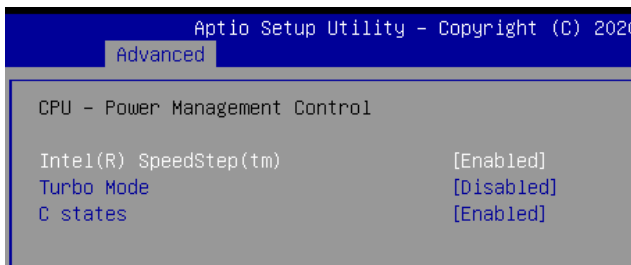
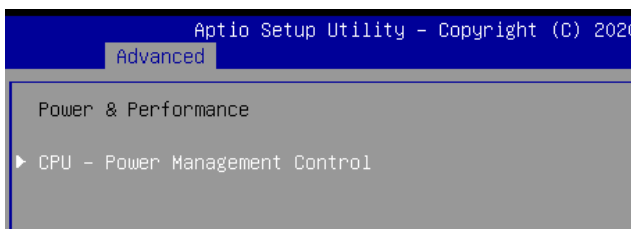
Enable or disable serial port 1. The optimal setting for base I/O address is 3F8h and for interrupt request line is IRQ4.

- **CPU Configuration**

This screen shows the CPU Configuration, and you can change the value of the selected option.



- **CPU Power Management Configuration**



Intel® SpeedStep™

Enable or disable Intel SpeedStep mode. The default setting is Enabled.

Turbo Mode

Enable or disable turbo mode. The default setting is Disabled.

C-states

Enable or disable C States. The default setting is Enabled

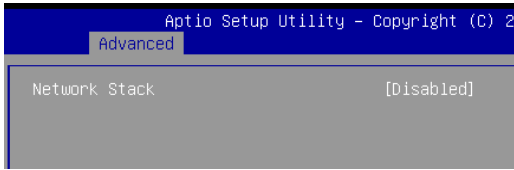
Active Processor Cores

Select the number of CPU cores. The default setting is All.

Hyper-Threading

Enable or disable Intel Hyper-Threading Technology

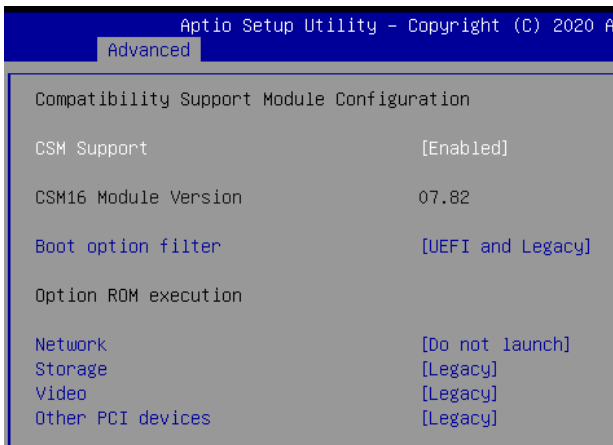
- **Network Stack Configuration**



Network Stack

Enable or disable UEFI Network stack. The default setting is disabled.

- **CSM (Compatibility Support Module) Configuration**



CSM Support

Enable or disable CSM support. The default setting is Enabled.

Boot optional filter

Controls the priority of Legacy and UEFI ROMs.

Network

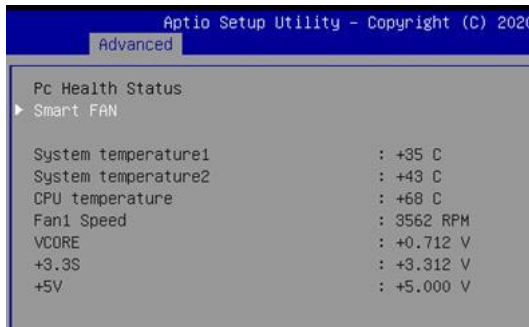
Controls the execution of UEFI and Legacy PXE OpROM.

Video

Controls the execution of UEFI and Legacy Video OpROM.

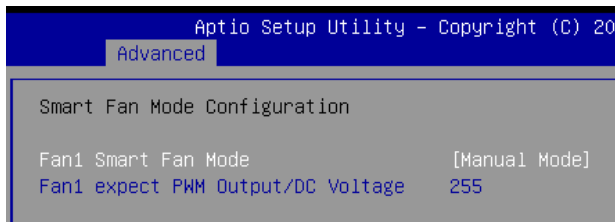
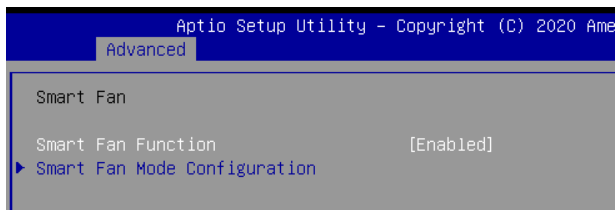
- **Hardware Monitor**

This menu allows the user to monitor hardware health status as well as enable or disable the Smart Fan function.



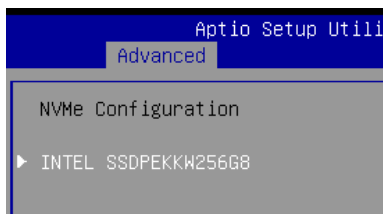
This screen displays the temperature of system memory area (System temperature1), power-in area (System temperature2) and CPU, fan speed, system voltages (VCORE, +3.3V, and +5V).

- **Smart Fan**



- **NVMe Configuration**

This menu specifies NVMe storage information. For items marked with "▶", please press <Enter> for more options.



```

Aptio Setup Utility - Copyright (C) 2020 AMI
Advanced
-----
Seg:Bus:Dev:Func          00:01:00:00
Model Number              INTEL SSDPEKKW256G8
Total Size                 256.0 GB
Vendor ID                 8086
Device ID                 F1A6

Namespace: 1              Size: 256.0 GB

```

- **PCH-FW configuration**

This menu shows the ME firmware information.

```

Aptio Setup Utility - Copyright (C) 2020 AMI
Advanced
-----
ME Firmware Version       12.0.40.1433
ME Firmware Mode          Normal Mode
ME Firmware SKU           Corporate SKU
ME Firmware Status 1     0x90000255
ME Firmware Status 2     0x80108106

```

- **RTC Wake setting**

This menu allows the user to enable the system to wake on an alarm event using a real-time clock (RTC).

```

Aptio Setup Utility - Copyright (C) 2020 AMI
Advanced
-----
Wake system from S5      [Disabled]

```

- **USB Configuration**

This screen specifies USB settings.

```

Aptio Setup Utility - Copyright (C) 2020 AMI
Advanced
-----
USB Configuration
USB Module Version       23

USB Controllers:
  1 XHCI
USB Devices:
  1 Drive, 1 Keyboard, 1 Mouse, 1 Hub

Legacy USB Support       [Enabled]
USB Mass Storage Driver Support [Enabled]

```

USB Devices

Display all detected USB devices.

Legacy USB Support

Enable or disable legacy USB support.

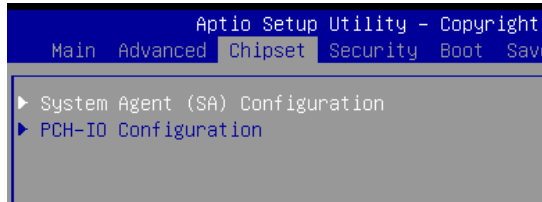
USB Mass Storage Driver Support

Enable or disable USB mass storage driver support.

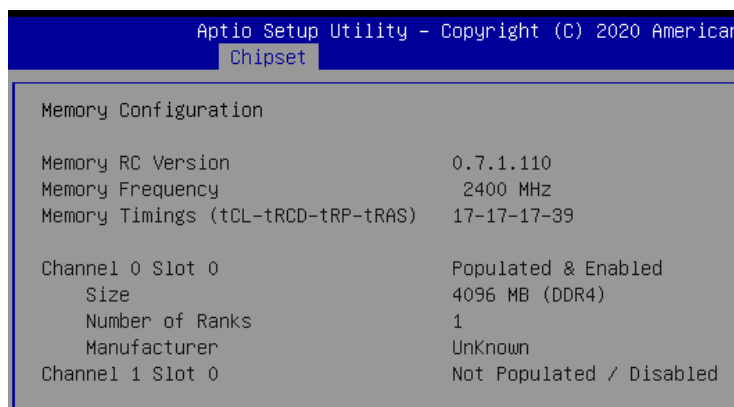
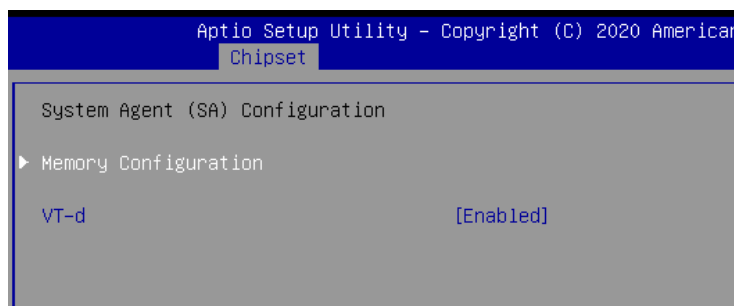
4.5 Chipset Menu

The Chipset menu allows users to change the advanced chipset settings. You can select any of the items in the left frame of the screen to go to the sub menus:

For items marked with “▶”, please press <Enter> for more options.



- System Agent (SA) Configuration**
 This screen allows users to configure memory parameters.

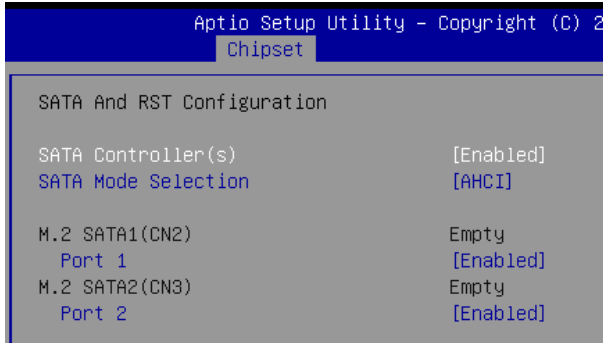


- PCH-IO Configuration**
 This screen shows the information of the South Bridge chipset. For items marked with “▶”, please press <Enter> for more options.



- **SATA and RST Configuration**

In the SATA Configuration menu, you can see the currently installed hardware in the SATA ports. During system boot up, the BIOS automatically detects the presence of SATA devices.



SATA Controller(s)

Enable or disable the SATA Controller feature. The default is Enabled.

SATA Mode Selection

Determine how SATA controller(s) operate. Operation mode options are AHCI (Advanced Host Controller Interface) and Intel RST Premium mode. The default is AHCI mode.

4.6 Security Menu

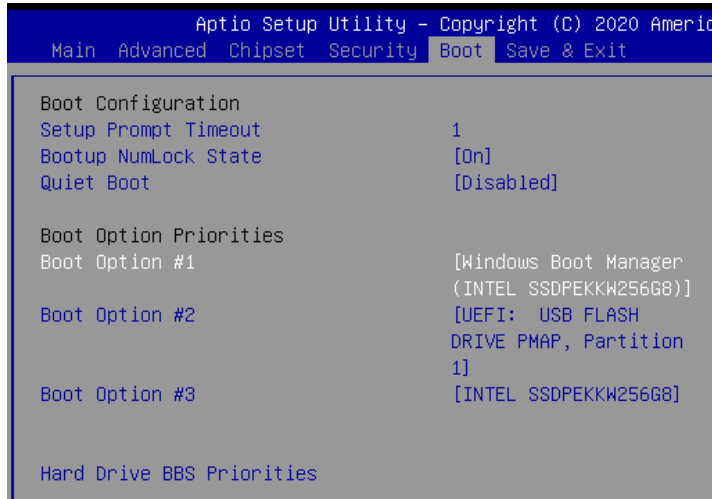
The Security menu allows users to enhance system security by creating an administrator password to limit system access.



- **Administrator Password**
Set up an administrator password.

4.7 Boot Menu

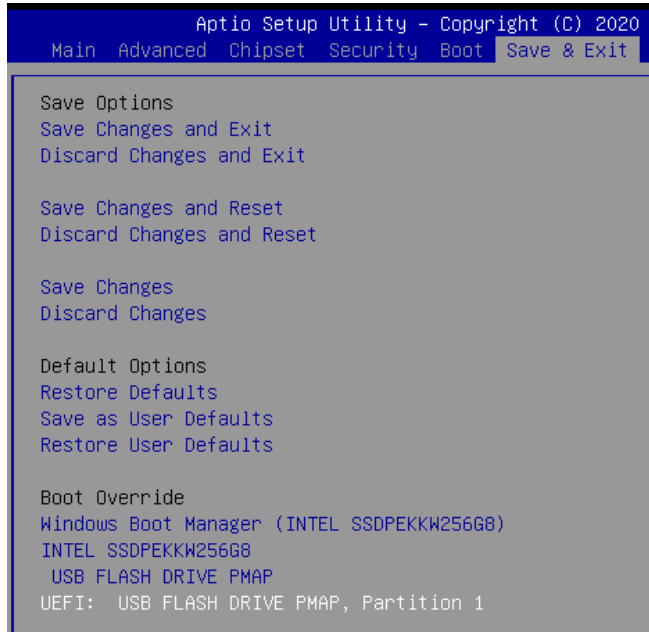
The Boot menu allows users to change boot options of the system.



- **Setup Prompt Timeout**
Set up number of seconds to wait for the setup activation key. 65535(0xFFFF) means indefinite waiting.
- **Bootup NumLock State**
Use this item to select the power-on state for the keyboard NumLock.
- **Quiet Boot**
Select to display either POST output messages or a splash screen during boot up.
- **Boot Option Priorities [Boot Option #1]**
These are settings for boot priority. Specify the boot device priority sequence from the available devices.

4.8 Save & Exit Menu

The Save & Exit menu allows users to load system configurations with optimal or fail-safe default values.



- **Save Changes and Exit**
When you have completed the system configuration changes, select this option to leave Setup and continue to boot to operating system. Select Save Changes and Exit from the Save & Exit menu and press <Enter>. Select Yes to save changes and exit.
- **Discard Changes and Exit**
Select this option to quit Setup without making any permanent changes to the system configuration and continue to boot to operating system. Select Discard Changes and Exit from the Save & Exit menu and press <Enter>. Select Yes to discard changes and exit.
- **Save Changes and Reset**
When you have completed the system configuration changes, select this option to leave Setup and reboot the computer so the new system configuration parameters can take effect. Select Save Changes and Reset from the Save & Exit menu and press <Enter>. Select Yes to save changes and reset.
- **Discard Changes and Reset**
Select this option to quit Setup without making any permanent changes to the system configuration and reboot the computer. Select Discard Changes and Reset from the Save & Exit menu and press <Enter>. Select Yes to discard changes and reset.
- **Save Changes**
When you have completed the system configuration changes, select this option to save changes. Select Save Changes from the Save & Exit menu and press <Enter>. Select Yes to save changes.

- **Discard Changes**
Select this option to quit Setup without making any permanent changes to the system configuration. Select Discard Changes from the Save & Exit menu and press <Enter>. Select Yes to discard changes.
- **Restore Defaults**
It automatically sets all Setup options to a complete set of default settings when you select this option. Select Restore Defaults from the Save & Exit menu and press <Enter>.
- **Save as User Defaults**
Select this option to save system configuration changes done so far as User Defaults. Select Save as User Defaults from the Save & Exit menu and press <Enter>.
- **Restore User Defaults**
It automatically sets all Setup options to a complete set of User Defaults when you select this option. Select Restore User Defaults from the Save & Exit menu and press <Enter>.
- **Boot Override**
Select a drive to immediately boot that device regardless of the current boot order.

This page is intentionally left blank.

Appendix A

Watchdog Timer

A.1 About Watchdog Timer

Software stability is a major issue in most application. Some embedded systems are not watched by human for 24 hours. It is usually too slow to wait for someone to reboot when computer hangs. The systems need to be able to reset automatically when things go wrong. The watchdog timer gives us solutions in this regard.

The watchdog timer is a counter that triggers a system reset when it counts down to zero from a preset value. The software starts the counter with an initial value and must reset it periodically. If the counter ever reaches zero which means the software has crashed, the system will reboot.

A.2 How to Use Watchdog Timer

Start

↓

Un-Lock WDT:

O 2E 87 ; Un-lock super I/O
O 2E 87 ; Un-lock super I/O

↓

Select Logic device:

O 2E 07
O 2F 08

↓

Enable WDT:

O 2E 30
O 2F 01

↓

Set Second or Minute:

O 2E F0
O 2F N ; N=00 or 08 (See **Note** below)

↓

WDT counting re-set timer:

O 2E F1
O 2F M ; M=00,01,02,...FF (See **Note** below)

;IF to disable WDT:

O 2E 30
O 2F 00 ; Can be disabled at any time

- Timeout Value Range
 - 1 to 255
 - Minute / Second

 **Note:**

If **N=00h**, the time base is set to second.

M = time value

00h: Time-out Disable

01h: Time-out occurs after 1 second

02h: Time-out occurs after 2 seconds

03h: Time-out occurs after 3 seconds

.

.

FFh: Time-out occurs after 255 seconds

If **N=08h**, the time base is set to minute.

M = time value

00h: Time-out Disable

01h: Time-out occurs after 1 minute

02h: Time-out occurs after 2 minutes

03h: Time-out occurs after 3 minutes

.

.

FFh: Time-out occurs after 255 minutes