

SPC-4500 USER

Intel Atom[®] x7-E3950 (Apollo Lake) Fanless Embedded System,
Ultra-Compact, Rugged, PoE⁺, -40°C to 85°C Operation

Manual

Record of Revision

Version	Date	Page	Description	Remark
0.10	05/23/2019	All	Preliminary Release	
1.00	06/04/2019	All	Official Release	
1.10	06/25/2019	70, 71, 72	Update	
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1.30	03/23/2021	3, 5, 13, 16	Update	
1.40	29/05/2024	8, 9	Update	

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Declaration of Conformity

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

CE The products described in this manual comply with all applicable European Union (CE) directives if it has a CE marking. For computer systems to remain CE compliant, only CE-compliant parts may be used. Maintaining CE compliance also requires proper cable and cabling techniques.

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Order Information

Part Number	Description
SPC-4500	SPC-4500, Intel Atom® x7-E3950 SoC, 2 GigE LAN support IEEE 1588 (PTP), 4 COM, 4 USB, 1 SIM, 12V DC-in
SPC-4600	SPC-4600, Intel Atom® x7-E3950 SoC, 2 PoE+ support IEEE 1588 (PTP), 4 COM, 16 Isolated DIO, 4 USB, 1 SIM, 9 to 36V DC-in with Isolation & Ignition Power Control

Order Accessories

Part Number	Description
DDR3L8G	Certified DDR3L-1866/1600 8G RAM
DDR3L4G	Certified DDR3L-1866/1600 4G RAM
PWA-160W-WT-12V	160W, 12V, 85V AC to 264V AC Power Adapter with 3-pin Terminal Block, Wide Temperature -30°C to +70°C
PWA-160W-WT	160W, 24V, 85V AC to 264V AC Power Adapter with 3-pin Terminal Block, Wide Temperature -30°C to +70°C
PWA-120W-12V	120W, 12V, 90V AC to 264V AC Power Adapter with 3-pin Terminal Block
PWA-120W	120W, 24V, 90V AC to 264V AC Power Adapter with 3-pin Terminal Block
TMK2-20P-100	Terminal Block 20-pin to Terminal Block 20-pin Cable, 100cm
TMK2-20P-500	Terminal Block 20-pin to Terminal Block 20-pin Cable, 500cm
TMB-TMBK-20P	Terminal Board with One 20-pin Terminal Block Connector and DIN-Rail Mounting
4G Module	Mini PCIe 4G/GPS Module with Antenna
WiFi & Bluetooth	WiFi & Bluetooth Module with Antenna

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1

GENERAL INTRODUCTION

1.1 Overview

SPC-4500 is an Ultra-compact Fanless PoE⁺ Embedded Box PC for smart industrial-grade IoT applications. With low-power quad-core Intel Atom[®] x7-E3950 processor (Apollo Lake) engine, single DDR3L SO-DIMM supports up to 8GB memory; Advanced Intel[®] HD graphics 505 supports DirectX 12, OpenGL 4.3 and OpenCL 2.1 API, up to 4K resolution; Vecow SPC-4500 delivers more than 150% system performance improved and up to 300% graphics performance enhanced than the embedded engine powered by the former generation Intel Atom[®] E3845 SoC.

Supports DVI-I and DisplayPort dual display, built-in dual GigE LAN supporting IEEE 1588 Precision Time Protocol (PTP), 4 COM RS-232/422/485, 1 SIM for WiFi/4G/3G/LTE/GPRS/UMTS, 4 USB, 2 Mini PCIe, 1 SATA III, 12V DC power input, optional 9V to 36V wide range DC power input, TPM 2.0, remote power switch, rugged design for fanless -40°C to 85°C operation, Vecow SPC-4500 Series features compact integrated functions with flexible configurations to meet your requirements for smart embedded applications.

With outstanding system performance, compact integrated functions, rugged reliability, system-oriented solution and versatile configurations, Vecow SPC-4500 Series Ultra-compact Fanless PoE⁺ Embedded Box PC is your great choice for Machine Vision, In-vehicle Computing, Factory Automation, Intelligent Control, Robotic Control, and any Internet of Thing (IoT) or Industry 4.0-related applications.

1.2 Features

- Quad Core Intel Atom[®] x7-E3950 SoC (Apollo Lake-I) supports lower power consumption
- Fanless, -40°C to 85°C Extended Operating Temperature
- DDR3L 1866MHz Memory, up to 8GB
- 2 Independent GigE PoE⁺ LAN support IEEE 802.3at/IEEE 1588 (PTP) & 1kV Isolation
- 16 Isolated DIO, 4 USB 3.0, 4 COM RS-232/422/485
- External SIM socket supports WiFi/4G/3G/LTE/GPRS/UMTS
- 12V DC Power Input, optional supports 9V to 36V wide range DC power input
- Configurable Ignition Power Control
- TPM 2.0 supported

1.3 Product Specification

1.3.1 Specifications of SPC-4500

System	
Processor	Intel Atom® x7-E3950 processor (Apollo Lake-I)
BIOS	AMI
SIO	IT8786E
Memory	1 DDR3L 1866MHz SO-DIMM, up to 8GB
I/O Interface	
Serial	4 COM RS-232/422/485
USB	4 USB 3.0 (External)
LED	Power, HDD, wireless
SIM	1 SIM Card Socket (External)
Expansion	
Mini PCIe	2 Mini PCIe sockets : <ul style="list-style-type: none">• 1 Mini PCIe for PCIe/USB/SIM card• 1 Mini PCIe for PCIe/USB/Optional mSATA
Graphics	
Graphics Processor	Intel® HD graphics 505
Interface	<ul style="list-style-type: none">• DVI-I : DVI up to 3840 x 2160 @60Hz• DP : Up to 4096 x 2160 @60Hz
Storage	
SATA	1 SATA III (6Gbps)
mSATA	1 SATA III (Mini PCIe type, 6Gbps)
Storage Device	1 2.5" SSD/HDD bracket (Internal)
Audio	
Audio Codec	Realtek ALC888S-VD, 7.1 Channel HD Audio
Audio Interface	1 Line-out
Ethernet	
LAN 1	Intel® I210 GigE LAN supports IEEE 1588
LAN 2	Intel® I210 GigE LAN supports IEEE 1588

Power	
Power Input	Single 12V DC power input
Power Interface	3-pin Terminal Block : V+, V-, Frame Ground
Others	
TPM	Optional Infineon SLB9665 supports TPM 2.0, LPC interface
Watchdog Timer	Reset : 1 to 255 sec./min. per step
HW Monitor	Monitoring temperature, voltages. Auto throttling control when CPU overheats.
Software Support	
OS	Windows 10, Linux
Mechanical	
Dimension	(W) 106.0mm x (L) 150.0mm x (H) 59.0mm (4.17" x 5.91" x 2.32")
Weight	0.9 kg (1.98 lb)
Mounting	<ul style="list-style-type: none"> • Wallmount by mounting bracket • DIN Rail mount (Optional) • 2U Rackmount (Optional)
Environment	
Operating Temperature	-40°C to 85°C (-40°F to 185°F)
Storage Temperature	-40°C to 85°C (-40°F to 185°F)
Humidity	5% to 95% Humidity, non-condensing
Relative Humidity	95% at 85°C
Shock	<ul style="list-style-type: none"> • IEC 60068-2-27 • SSD : 50G @ wallmount, Half-sine, 11ms
Vibration	<ul style="list-style-type: none"> • IEC 60068-2-64 • SSD : 5Grms, 5Hz to 500Hz, 3 Axis
EMC	CE, FCC, EN50155, EN50121-3-2

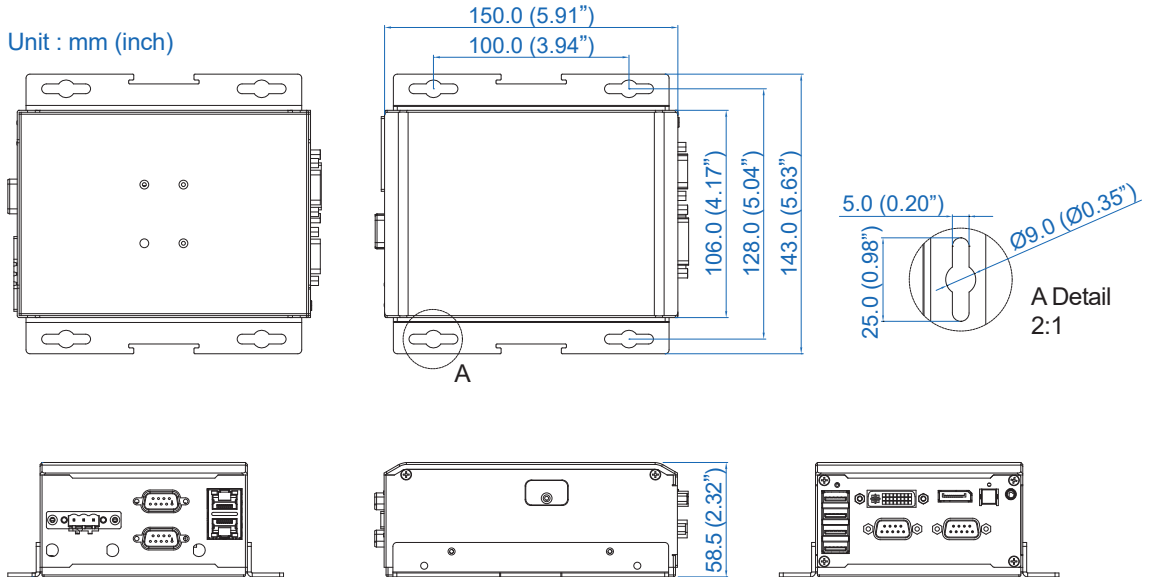
1.3.2 Specifications of SPC-4600

System	
Processor	Intel Atom [®] x7-E3950 processor (Apollo Lake-I)
BIOS	AMI
SIO	IT8786E
Memory	1 DDR3L 1866MHz SO-DIMM, up to 8GB
I/O Interface	
Serial	4 COM RS-232/422/485
USB	4 USB 3.0 (External)
DIO	16 Isolated DIO : 8 DI, 8 DO
LED	Power, HDD, wireless, PoE
SIM	1 SIM Card Socket (External)
Expansion	
Mini PCIe	2 Mini PCIe sockets : <ul style="list-style-type: none"> • 1 Mini PCIe for PCIe/USB/SIM card • 1 Mini PCIe for PCIe/USB/Optional mSATA
Graphics	
Graphics Processor	Intel [®] HD graphics 505
Interface	<ul style="list-style-type: none"> • DVI-I : DVI up to 3840 x 2160 @60Hz • DP : Up to 4096 x 2160 @60Hz
Storage	
SATA	1 SATA III (6Gbps)
mSATA	1 SATA III (Mini PCIe type, 6Gbps)
Storage Device	1 2.5" SSD/HDD bracket (Internal)
Audio	
Audio Codec	Realtek ALC888S-VD, 7.1 Channel HD Audio
Audio Interface	1 Line-out
Ethernet (PoE)	
LAN 1	GigE IEEE 802.3at (25.5W/48V) PoE ⁺ by Intel [®] I210, IEEE 1588 supported
LAN 2	GigE IEEE 802.3at (25.5W/48V) PoE ⁺ by Intel [®] I210, IEEE 1588 supported

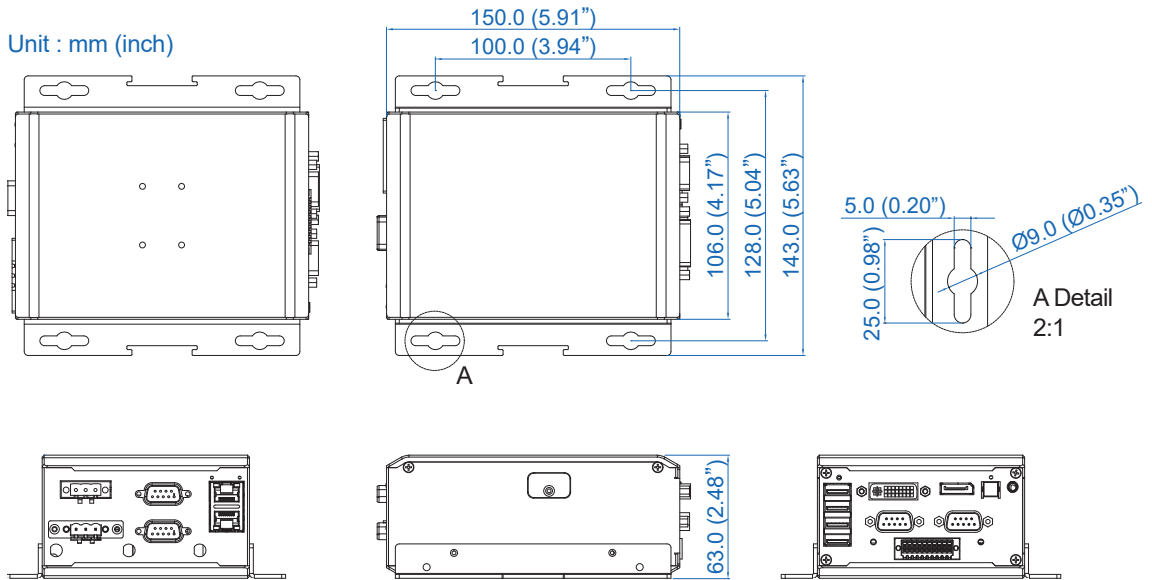
Power	
Power Input	Single 12V DC power input
Power Interface	3-pin Terminal Block : V+, V-, Frame Ground
Ignition Control	16 Mode (Internal)
Remote Switch	3-pin Terminal Block : On, Off, IGN
Others	
TPM	Optional Infineon SLB9665 supports TPM 2.0, LPC interface
Watchdog Timer	Reset : 1 to 255 sec./min. per step
HW Monitor	Monitoring temperature, voltages. Auto throttling control when CPU overheats.
Software Support	
OS	Windows 10, Linux
Mechanical	
Dimension	(W) 106.0mm x (L) 150.0mm x (H) 63.0mm (4.17" x 5.91" x 2.48")
Weight	1.2 kg (2.65 lb)
Mounting	<ul style="list-style-type: none"> • Wallmount by mounting bracket • DIN Rail mount (Optional) • 2U Rackmount (Optional)
Environment	
Operating Temperature	-40°C to 75°C (-40°F to 167°F)
Storage Temperature	-40°C to 85°C (-40°F to 185°F)
Humidity	5% to 95% Humidity, non-condensing
Relative Humidity	95% at 75°C
Shock	<ul style="list-style-type: none"> • IEC 60068-2-27 • SSD : 50G @ wallmount, Half-sine, 11ms
Vibration	<ul style="list-style-type: none"> • IEC 60068-2-64 • SSD : 5Grms, 5Hz to 500Hz, 3 Axis
EMC	CE, FCC, EN50155, EN50121-3-2

1.4 Mechanical Dimension

1.4.1 Dimensions of SPC-4500



1.4.2 Dimensions of SPC-4600







2

GETTING TO KNOW YOUR SPC-4500

2.1 Packing List






2.1.1 Packing List for SPC-4500

Item	Description	Qty
1	SPC-4500 Embedded System	1
2	SPC-4500 accessory box, which contains <ul style="list-style-type: none">• Vecow Drivers & Utilities DVD• Wall-mounting bracket• Foot Pad• Screws & Terminal blocks	1 2 4 (Below)

Item	Description	Outlook	Usage	P/N	Qty
1	PHILLPIS M4x16L with washer, Ni		Mount	53-24D6416-30B	4
2	PHILLPIS M2.5x6L, Ni		Mini PCIe slot	53-2426906-30B	2
3	M3x4L		Wall mount bracket/SSD/ HDD	53-2470000-218	8
4	Terminal block 3-pin (5.0mm)		DC-IN	51-2411R03-S1B	2

2.1.2 Packing List for SPC-4600

Item	Description	Qty
1	SPC-4600 Embedded System	1
2	SPC-4600 accessory box, which contains <ul style="list-style-type: none"> • Vecow Drivers & Utilities DVD • Wall-mounting bracket • Foot Pad • Screws & Terminal block 	1 2 4 (Below)

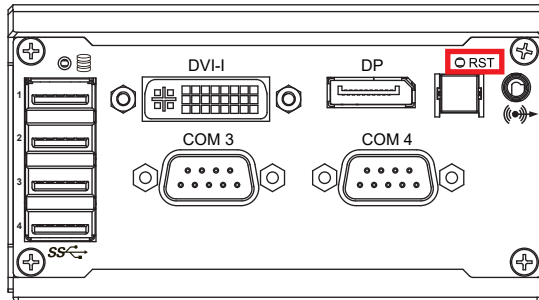
Item	Description	Outlook	Usage	P/N	Qty
1	PHILLPIS M4x16L with washer, Ni		Mount	53-24D6416-30B	4
2	PHILLPIS M2.5x6L, Ni		Mini PCIe slot	53-2426906-30B	2
3	PHILLPIS M3x4L		SSD/HDD	53-M000450-301	8
4	Terminal block 3-pin (5.0mm)		DC-IN	51-2411R03-S1B	2
5	Terminal block 20-pin (2.54mm)		Isolated DIO	51-2112R20-S1D	1

2.2 Front Panel I/O & Functions

In Vecow's SPC-4500 series family, all I/O connectors are located on the front panel. Most of the general connections to the computer device, such as audio, USB, Isolated COM, DVI and HDMI, are placed on the front panel.

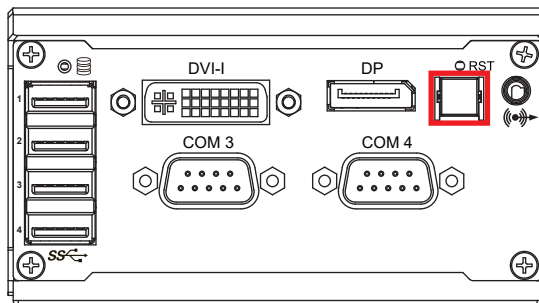
2.2.1 SPC-4500 Front I/O & Functions

2.2.1.1 Reset Tact Switch



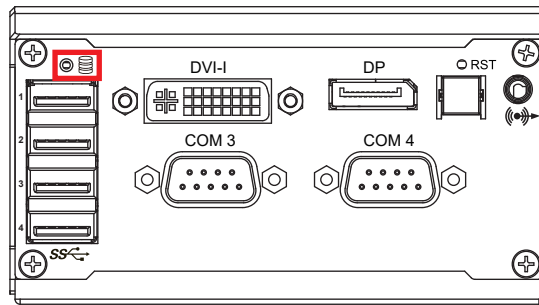
It is a hardware reset switch. Use this switch to reset the system without power off the system. Press the Reset Switch for a few seconds, and then reset will be enabled.

2.2.1.2 Power Button



The Power Button is a non-latched switch. To power on the system, press the power button and then the Blue LED is lightened. To power off the system, you can either command shutdown by OS operation or just simply press the power button and then the Red LED is lightened. If system error, you can just press the power button for 4 seconds to shut down the machine directly. Please do note that a 4-second interval between each 2 power-on/power-off operation is necessary in normal working status. (For example, once turning off the system, you have to wait for 4 seconds to initiate another power-on operation).

2.2.1.3 PWR and HDD LED Indicator



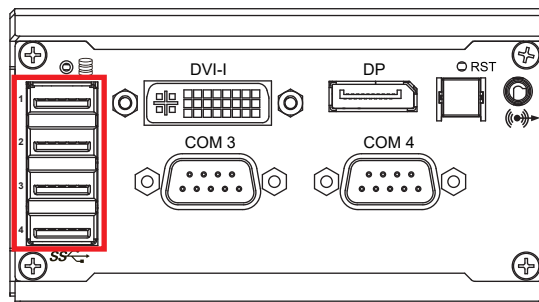
Power LED/(Right): The LED is solid Blue, it indicates that the system is powered on (S0).

If LED is solid Red, it indicates that the system is powered off (S5).

HDD LED/(Left): If the LED is on, it indicates that the system's storage is functional. If it is off, it indicates that the system's storage is not functional. If it is flashing, it indicates data access activities.

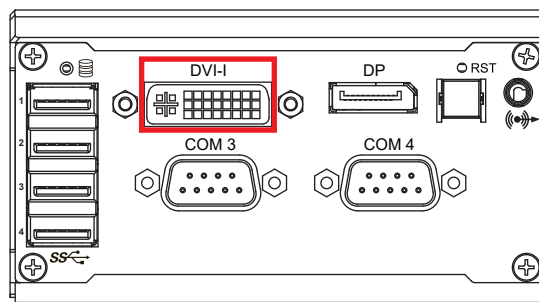
LED Color	Indication	System Status
Orange	HDD	On/Off : Storage status, function or not. Twinkling : Data transferring.
Blue/Red	Power	System power status (S0/S5)

2.2.1.4 USB 3.0



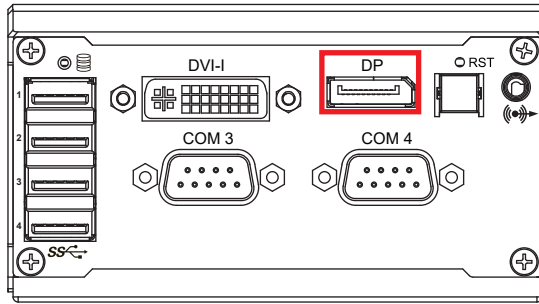
There are 4 USB 3.0 connections available supporting up to 5GB per second data rate in the front side of SPC-4500. It is also compliant with the requirements of Super Speed (SS), high speed (HS), full speed (FS) and low speed (LS).

2.2.1.5 DVI-I



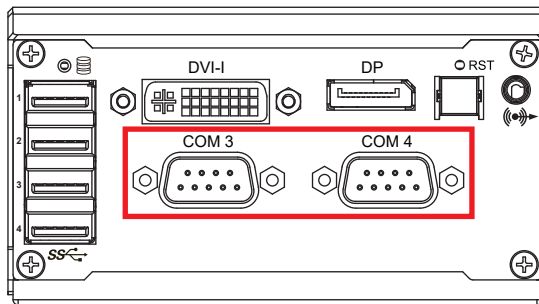
Onboard VGA Port supports auxiliary channel mode. The connection supports DVI-I including VGA and DVI ports. VGA Port supports auxiliary channel mode, connection supports up to 1920x1440 resolution at 60Hz. DVI Port supports DDC channel mode, connection supports up to 3840x2160 resolution at 30Hz.

2.2.1.6 DP



It supports DP1.2 and up to 4096×2160 resolution @ 60Hz.

2.2.1.7 Serial Port COM



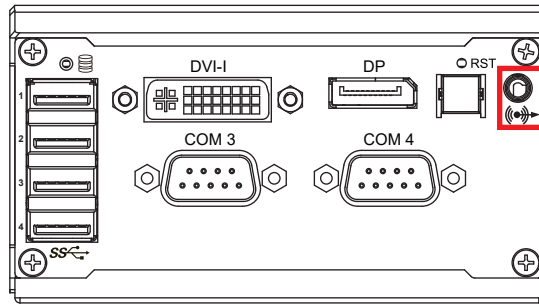
Serial port can be configured for RS-232, RS-422, or RS-485 with auto flow control communication. The default definition is RS-232. If you want to change to RS-422 or RS-485, you can find the setting in BIOS.

BIOS Setting	Function
COM3 (Left) COM4 (Right)	RS-232
	RS-422 (5-wire)
	RS-422 (9-wire)
	RS-485
	RS-485 w/z auto-flow control

COM3/COM4 pin assignments are listed in the following table :

Serial Port	Pin No.	RS-232	RS-422 (5-wire)	RS-422 (9-wire)	RS-485 (3-wire)
3 to 4	1	GND_EARTH	GND_EARTH	GND_EARTH	GND_EARTH
	2	GND	GND	GND	GND
	3	RI	-----	CTS-	RI
	4	DTR	RXD-	RXD-	-----
	5	CTS	-----	CTS+	-----
	6	TXD	RXD+	RXD+	-----
	7	RTS	-----	RTS+	-----
	8	RXD	TXD+	TXD+	DATA+
	9	DSR	-----	RTS-	-----
	10	DCD	TXD-	TXD-	DATA-

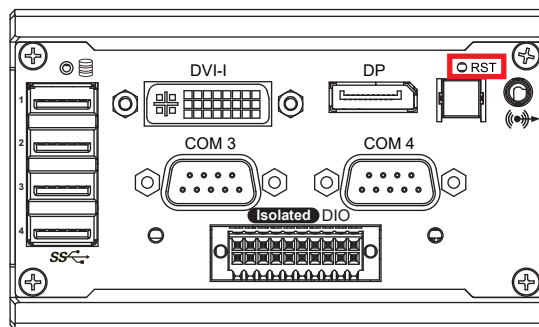
2.2.1.8 Audio Jack (Line-out only)



There is a Line-out in the front side of SPC-4500. Onboard Realtek ALC888S-VD audio codec supports 7.1 channel HD audio and fully complies with Intel® High Definition Audio (Azalia) specifications. To utilize the audio function in Windows platform, you need to install corresponding drivers for Realtek ALC888S-VD codec.

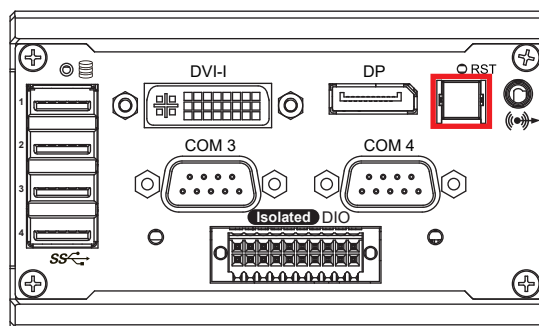
2.2.2 SPC-4600 Front I/O & Functions

2.2.2.1 Reset Tact Switch



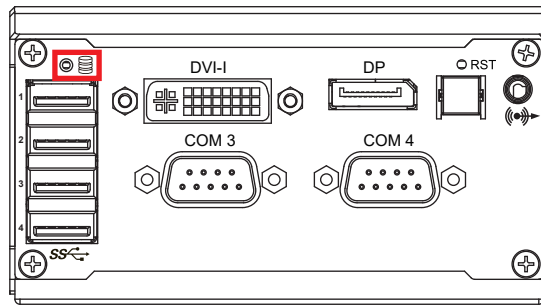
It is a hardware reset switch. Use this switch to reset the system without power off the system. Press the Reset Switch for a few seconds, then reset will be enabled.

2.2.2.2 Power Button



The Power Button is a non-latched switch. To power on the system, press the power button and then the Blue LED is lightened. To power off the system, you can either command shutdown by OS operation or just simply press the power button and then the Red LED is lightened. If system error, you can just press the power button for 4 seconds to shut down the machine directly. Please do note that a 4-second interval between each 2 power-on/power-off operation is necessary in normal working status. (For example, once turning off the system, you have to wait for 4 seconds to initiate another power-on operation).

2.2.2.3 PWR and HDD LED Indicator



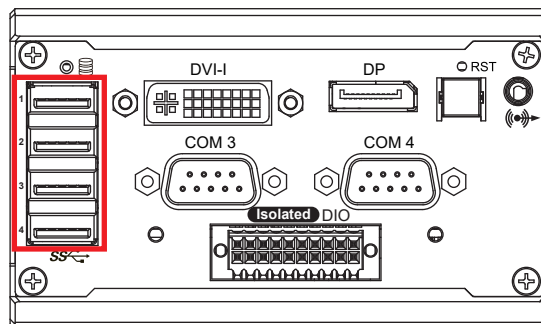
Power LED/(Right): The LED is solid Blue, it indicates that the system is powered on (S0).

If LED is solid Red, it indicates that the system is powered off (S5).

HDD LED/(Left): If the LED is on, it indicates that the system's storage is functional. If it is off, it indicates that the system's storage is not functional. If it is flashing, it indicates data access activities.

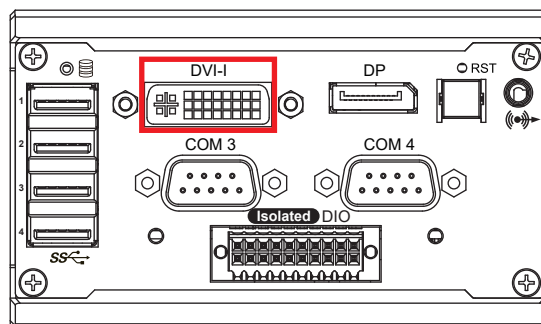
LED Color	Indication	System Status
Orange	HDD	On/Off : Storage status, function or not. Twinkling : Data transferring.
Blue/Red	Power	System power status (S0/S5)

2.2.2.4 USB 3.0



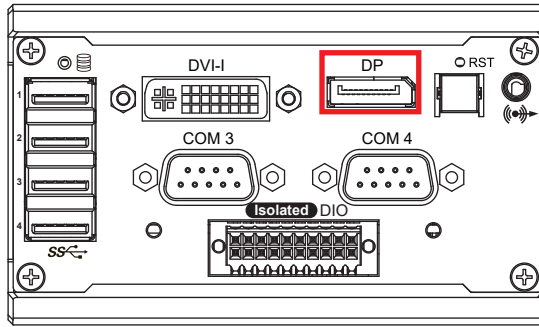
There are 4 USB 3.0 connections available supporting up to 5GB per second data rate in the front side of SPC-4600. It is also compliant with the requirements of Super Speed (SS), high speed (HS), full speed (FS) and low speed (LS).

2.2.2.5 DVI-I



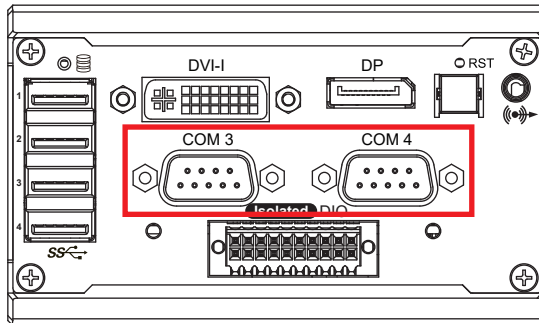
DVI-I includes VGA and DVI ports. VGA Port supports auxiliary channel mode, connection supports up to 1920x1440 resolution at 60Hz. DVI Port supports DDC channel mode, connection supports up to 3840x2160 resolution at 30Hz.

2.2.2.6 DP



It supports DP1.2 and up to 4096×2160 resolution @ 60Hz.

2.2.2.7 Serial Port COM



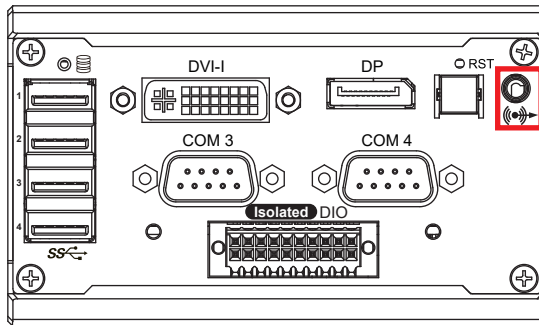
Serial port can be configured for RS-232, RS-422, or RS-485 with auto flow control communication. The default definition is RS-232. If you want to change to RS-422 or RS-485, you can find the setting in BIOS.

BIOS Setting	Function
COM3 (Left) COM4 (Right)	RS-232
	RS-422 (5-wire)
	RS-422 (9-wire)
	RS-485
	RS-485 w/z auto-flow control

COM3/COM4 pin assignments are listed in the following table :

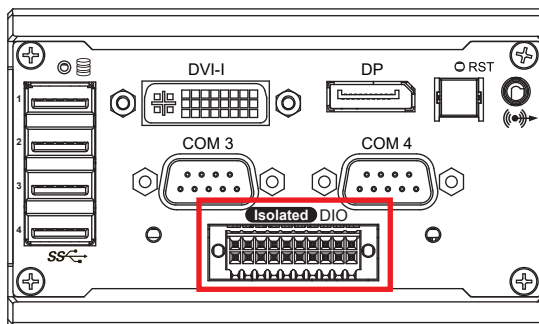
Serial Port	Pin No.	RS-232	RS-422 (5-wire)	RS-422 (9-wire)	RS-485 (3-wire)
3 to 4	1	GND_EARTH	GND_EARTH	GND_EARTH	GND_EARTH
	2	GND	GND	GND	GND
	3	RI	-----	CTS-	RI
	4	DTR	RXD-	RXD-	-----
	5	CTS	-----	CTS+	-----
	6	TXD	RXD+	RXD+	-----
	7	RTS	-----	RTS+	-----
	8	RXD	TXD+	TXD+	DATA+
	9	DSR	-----	RTS-	-----
	10	DCD	TXD-	TXD-	DATA-

2.2.2.8 Audio Jack (Line-out only)



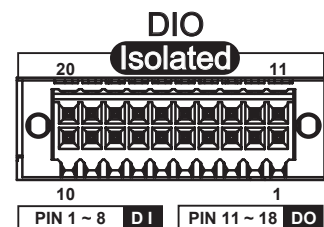
There is a Line-out in the front side of SPC-4500. Onboard Realtek ALC888S-VD audio codec supports 7.1 channel HD audio and fully complies with Intel® High Definition Audio (Azalia) specifications. To utilize the audio function in Windows platform, you need to install corresponding drivers for Realtek ALC888S-VD codec.

2.2.2.9 Isolated DIO



There is a 16-bit (8-bit DI, 8-bit DO) connectors in the front side of SPC-4600. DI/DIO supports NPN (sink) and PNP (Source) modes. Each DI pin is equipped with a photocoupler for isolated protection. Each DO pin is equipped with isolator function, DO Safety-Related Certifications :

- 4242-VPK Basic Isolation per DIN V VDE V 0884-10 and DIN EN 61010-1
- 3-KVRMS Isolation for 1 minute per UL 1577
- CSA Component Acceptance Notice 5A, IEC 60950-1 and IEC 61010-1 End Equipment Standards
- GB4943.1-2011 CQC Certified

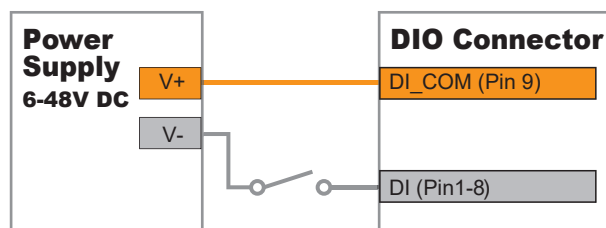


DIO Connectors pin out :

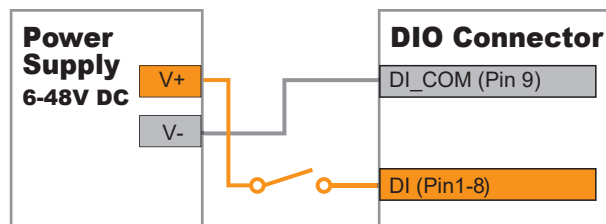
DIO	Pin No.	Definition	Function
DIO	1	INPUT 0	SIO_GPI80
	2	INPUT 1	SIO_GPI81
	3	INPUT 2	SIO_GPI82
	4	INPUT 3	SIO_GPI83
	5	INPUT 4	SIO_GPI84
	6	INPUT 5	SIO_GPI85
	7	INPUT 6	SIO_GPI86
	8	INPUT 7	SIO_GPI87
	9	DI_COM	-
	10	DIO_GND	-
	11	OUTPUT 0	SIO_GPO70
	12	OUTPUT 1	SIO_GPO71
	13	OUTPUT 2	SIO_GPO72
	14	OUTPUT 3	SIO_GPO73
	15	OUTPUT 4	SIO_GPO74
	16	OUTPUT 5	SIO_GPO75
	17	OUTPUT 6	SIO_GPO76
	18	OUTPUT 7	SIO_GPO77
	19	DIO_GND	-
	20	External 9-36VDC (NPN) External 9-36VDC (PNP)	-

DI reference circuit :

Sink Mode (NPN)

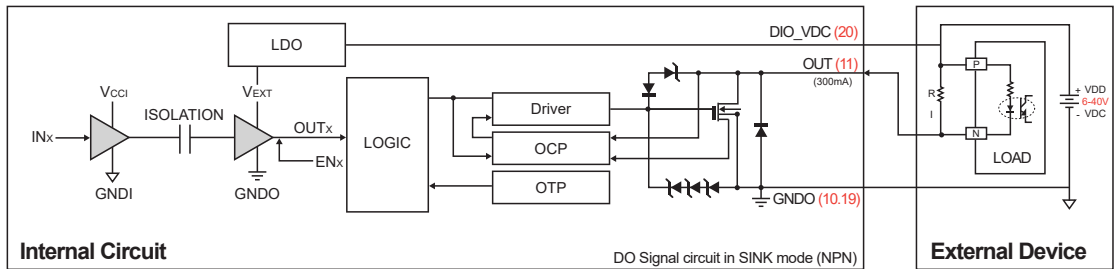


Source Mode (PNP)

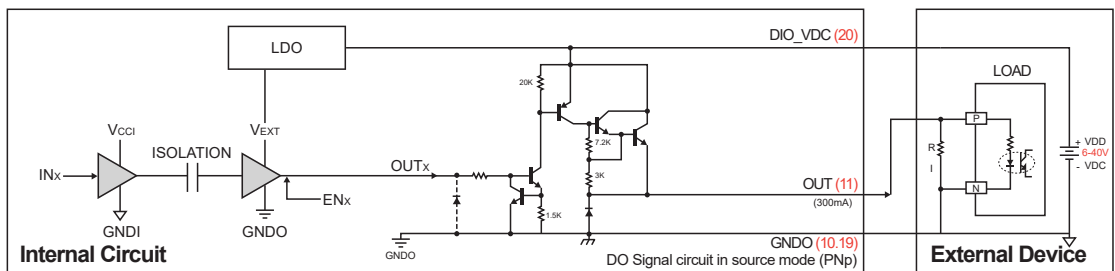


DO reference circuit :

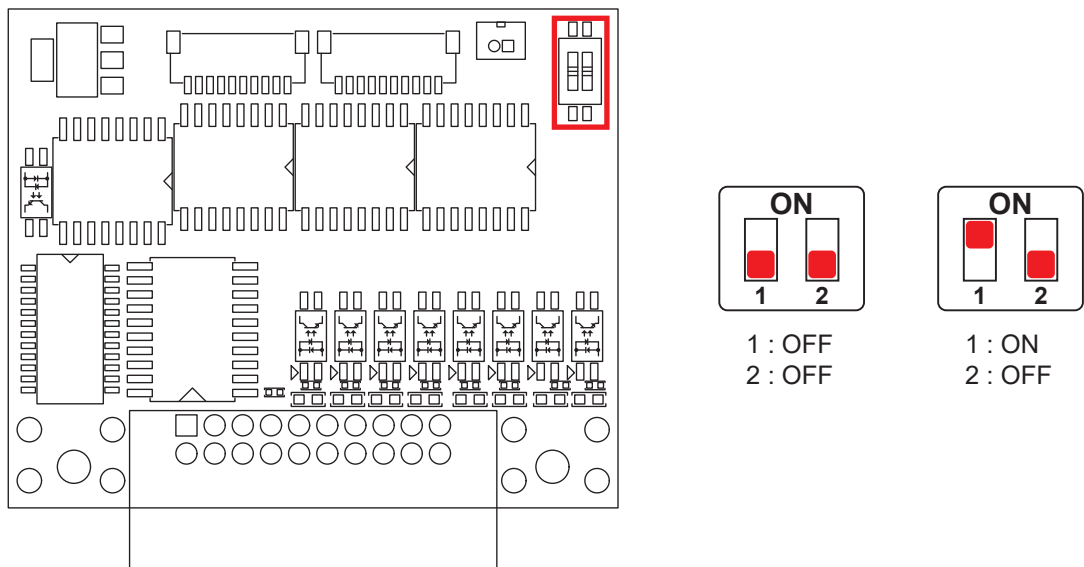
Sink Mode (NPN, Default)



Source (PNP)



SINK/SOURCE Mode control by HW DIP switch :



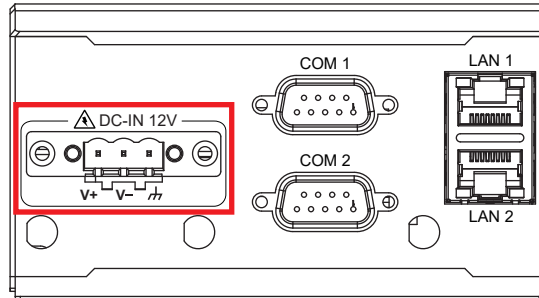
DIP Switch

PIN1	PIN2	Definition
OFF	ON	SINK
ON	OFF	SOURCE
OFF	OFF	Control by SW (Default)

2.3 Rear Panel I/O & Functions

2.3.1 SPC-4500 Rear I/O & Functions

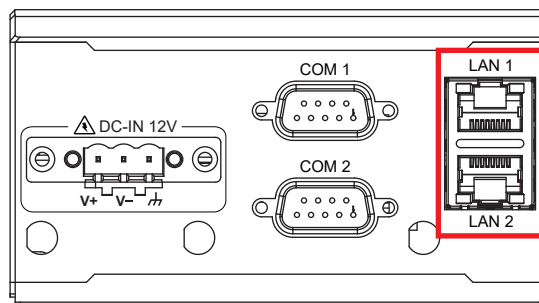
2.3.1.1 Power Terminal Block



SPC-4500 supports 12V DC only input by terminal block in the rear side. In normal power operation, power LED (front side) lightens in solid Blue and up to 40V surge protection.

Pin	Definition
1	V+
2	V-
3	Chassis Ground

2.3.1.2 10/100/1000 Mbps Ethernet Port



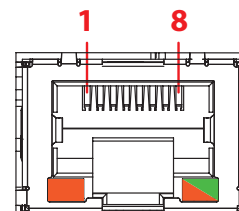
The 10/100/1000 Mbps Ethernet LAN ports 1 and 2 use 8-pin RJ-45 connector. LAN 1 and LAN 2 are equipped with Intel® I210 LAN chip. Using suitable RJ-45 cable, you can connect SPC-4500 system to a computer, or to any other piece of equipment that has an Ethernet connection; for example, a hub or a switch. Moreover, both of them have Wake-on-LAN and Preboot Execution Environment capabilities. The following diagram shows the pin assignment for LAN 1 and LAN 2 port.

Pin No.	10/100 Mbps	1000Mbps
1	E_TX+	MDI0_P
2	E_TX-	MDI0_N
3	E_RX+	MDI1_P
4	----	MDI2_P
5	----	MDI2_N
6	E_RX-	MDI1_N
7	-----	MDI3_P
8	-----	MDI3_N

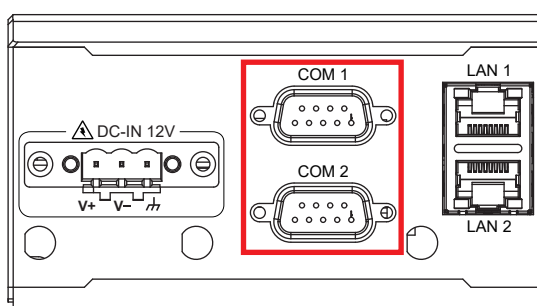
Each LAN port supports standard RJ-45 connector with LED indicator to present Active/Link/Speed status of the connection.

The LED indicator on the right bottom corner lightens in solid green when the cable is properly connected to a 100Mbps Ethernet network. The LED indicator on the right bottom corner lightens in solid orange when the cable is properly connected to a 1000Mbps Ethernet network. The left LED will keep twinkling/off when Ethernet data packets are being transmitted/received.

LED Location	LED Color	10Mbps	100Mbps	1000Mbps
Right	Green/ Orange	Off	Solid Green	Solid Orange
Left	Yellow	Twinkling Yellow	Twinkling Yellow	Twinkling Yellow



2.3.1.3 Serial Port (COM1/COM2)



Serial ports can be configured into RS-232, RS-422, or RS-485 with auto flow control communication. The default definition is RS-232. If you want to change to RS-422 or RS-485, you can find the setting in BIOS.

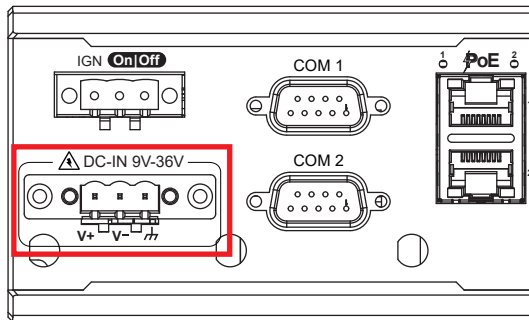
BIOS Setting	Function
COM1 (Upper) COM2 (Lower)	RS-232
	RS-422 (5-wire)
	RS-422 (9-wire)
	RS-485
	RS-485 w/z auto-flow control

COM1/COM2 pin assignments are listed in the following table :

Serial Port	Pin No.	RS-232	RS-422 (5-wire)	RS-422 (9-wire)	RS-485 (3-wire)	
1 to 2	1	GND_EARTH	GND_EARTH	GND_EARTH	GND_EARTH	
	2	GND	GND	GND	GND	
	3	RI	-----	CTS-	RI	
	4	DTR	-----	RXD-	-----	
	5	CTS	-----	CTS+	-----	
	6	TXD	-----	RXD+	-----	
	7	RTS	-----	RTS+	-----	
	8	RXD	-----	TXD+	TXD+	DATA+
	9	DSR	-----	-----	RTS-	-----
	10	DCD	-----	TXD-	TXD-	DATA-

2.3.2 SPC-4600 Rear I/O & Functions

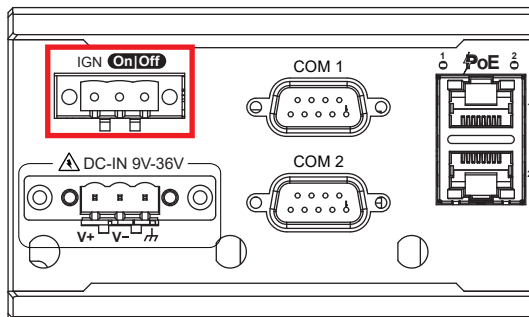
2.3.2.1 Power Terminal Block



SPC-4600 supports 9V to 36V DC power input by terminal block in the rear side. In normal power operation, power LED (front side) lightens in solid blue and up to 40V surge protection.

Pin	Definition
1	V+
2	V-
3	Chassis Ground

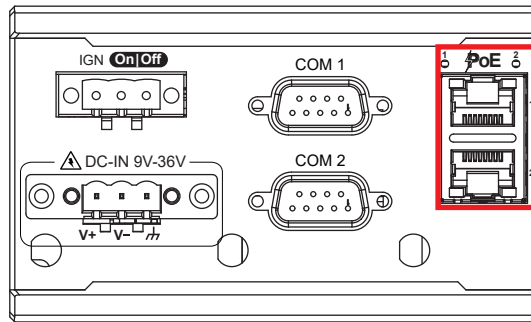
2.3.2.2 Remote Power On/Off Switch



It is a 2-pin power-on or power-off switch through Phoenix Contact terminal block. You could turn on or off the system power by using this contact. This terminal block supports dual function of soft power-on/power-off (instant off or delay 4 second), and suspend mode.

Pin	Definition
1	Ignition
2	SW+
3	SW-

2.3.2.3 PoE (Power over Ethernet)



There are 2 RJ45 connectors in the rear side of SPC-4600. It supports IEEE 802.3at (PoE+) Power over Ethernet (PoE) connection delivering up to 37W/54V per port and 1000BASE-T gigabit data signals over standard Ethernet Cat 5/Cat 6 cable.

Each PoE connection is powered by Intel® I210 Gigabit Ethernet controller and independent PCI express interface to connect with multi-core processor for network and data transmit optimization. Only when PoE port starts to supply power to power devices, the dedicated LED will be lightened.

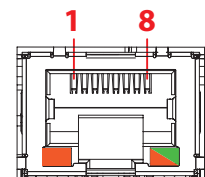
The pin-outs of each LAN is listed as follows :

Pin No.	10/100 Mbps	1000Mbps	PoE
1	E_TX+	MDI0_P	PoE+
2	E_TX-	MDI0_N	PoE+
3	E_RX+	MDI1_P	PoE-
4	-----	MDI2_P	-----
5	-----	MDI2_N	-----
6	E_RX-	MDI1_N	PoE-
7	-----	MDI3_P	-----
8	-----	MDI3_N	-----

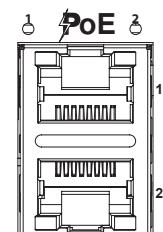
Each LAN port is supported by standard RJ-45 connector with LED indicators to present Active/Link/Speed status of the connection.

The LED indicator on the right bottom corner lightens in solid green when the cable is properly connected to a 100Mbps Ethernet network. The LED indicator on the right bottom corner lightens in solid orange when the cable is properly connected to a 1000Mbps Ethernet network. The left LED will keep twinkling/off when Ethernet data packets are being transmitted/received.

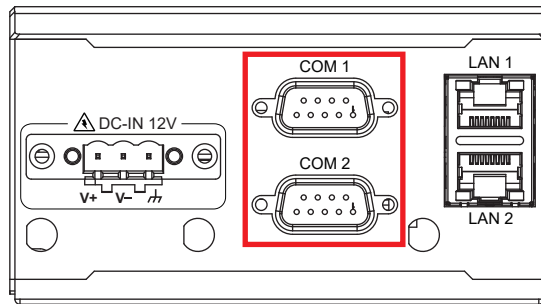
LED Location	LED Color	10Mbps	100Mbps	1000Mbps
Right	Green/Orange	Off	Solid Green	Solid Orange
Left	Yellow	Twinkling Yellow	Twinkling Yellow	Twinkling Yellow



POE LED	LED Color	POE Status
POE_LED1/POE_LED2	Solid Orange	POE ON



2.3.2.4 Serial Port COM



Serial ports can be configured into RS-232, RS-422, or RS-485 with auto flow control communication. The default definition is RS-232. If you want to change to RS-422 or RS-485, you can find the setting in BIOS.

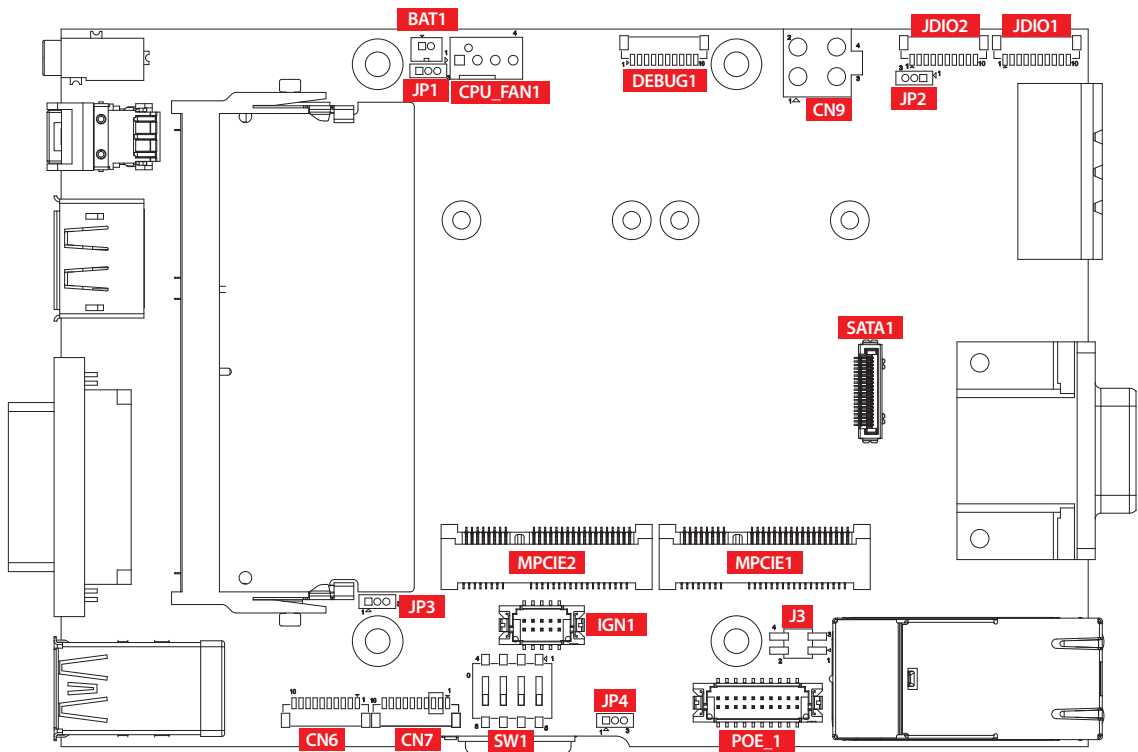
BIOS Setting	Function
COM1 (Upper) COM2 (Lower)	RS-232
	RS-422 (5-wire)
	RS-422 (9-wire)
	RS-485
	RS-485 w/z auto-flow control

COM1/COM2 pin assignments are listed in the following table :

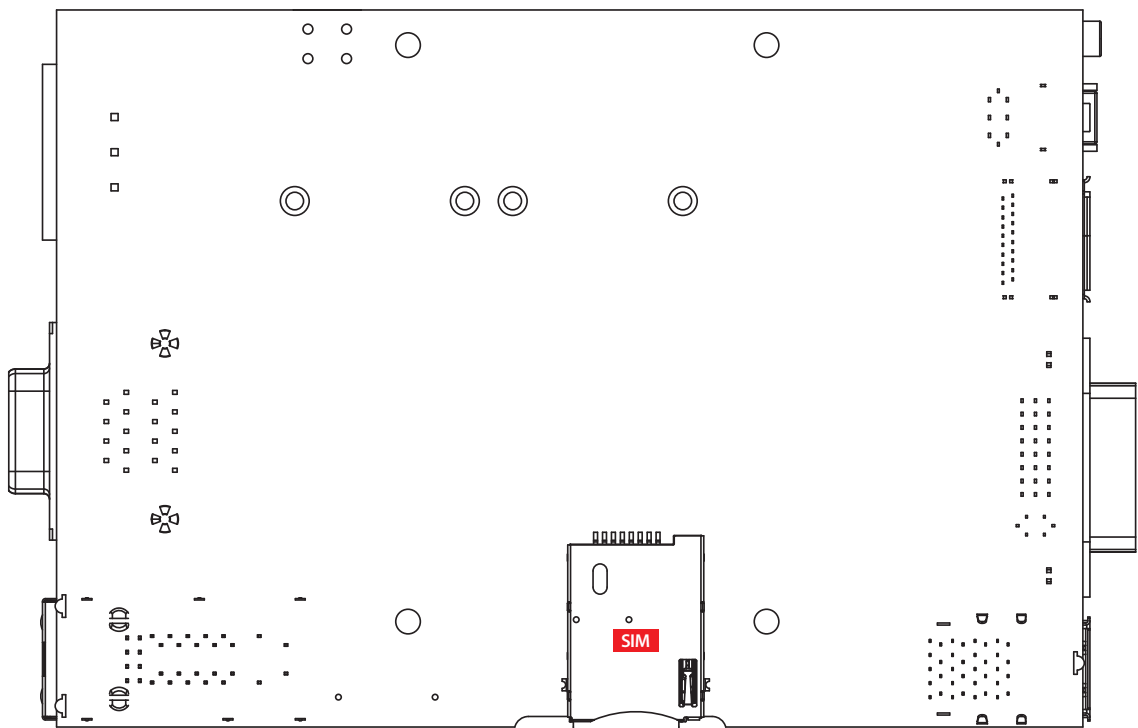
Serial Port	Pin No.	RS-232	RS-422 (5-wire)	RS-422 (9-wire)	RS-485 (3-wire)
1 to 2	1	GND_EARTH	GND_EARTH	GND_EARTH	GND_EARTH
	2	GND	GND	GND	GND
	3	RI	-----	CTS-	RI
	4	DTR	RXD-	RXD-	-----
	5	CTS	-----	CTS+	-----
	6	TXD	RXD+	RXD+	-----
	7	RTS	-----	RTS+	-----
	8	RXD	TXD+	TXD+	DATA+
	9	DSR	-----	RTS-	-----
	10	DCD	TXD-	TXD-	DATA-

2.4 Main Board Expansion Connectors

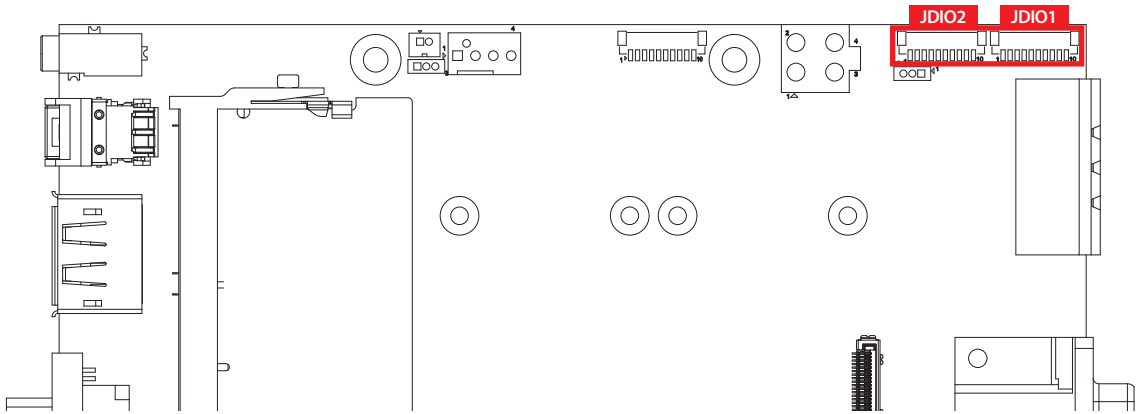
2.4.1 SPC-4500/SPC-4600 Main Board Pin Header Location (TOP SIDE)



2.4.1.1 Bottom side



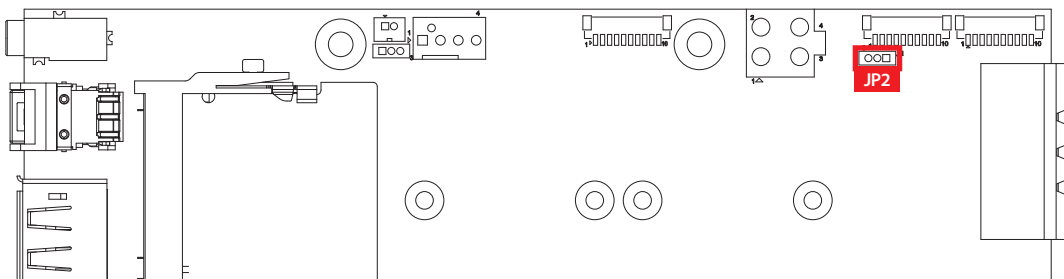
2.4.2 JDIO1, JDIO2



There is a 16-bit GPIO connector on the Top side. Each GPIO channel can be configured into GPI or GPO. Please refer to below table to see the pin definition in details. JDIO1 and JDIO2 Pin define as below.

	Pin No.	JDIO1 Definition	JDIO2 Definition
	1	SIO_GPI80	SIO_GPI84
	2	SIO_GPI81	SIO_GPI85
	3	SIO_GPI82	SIO_GPI86
	4	SIO_GPI83	SIO_GPI87
	5	SIO_GPO70	SIO_GPO74
	6	SIO_GPO71	SIO_GPO75
	7	SIO_GPO72	SIO_GPO76
	8	SIO_GPO73	SIO_GPO77

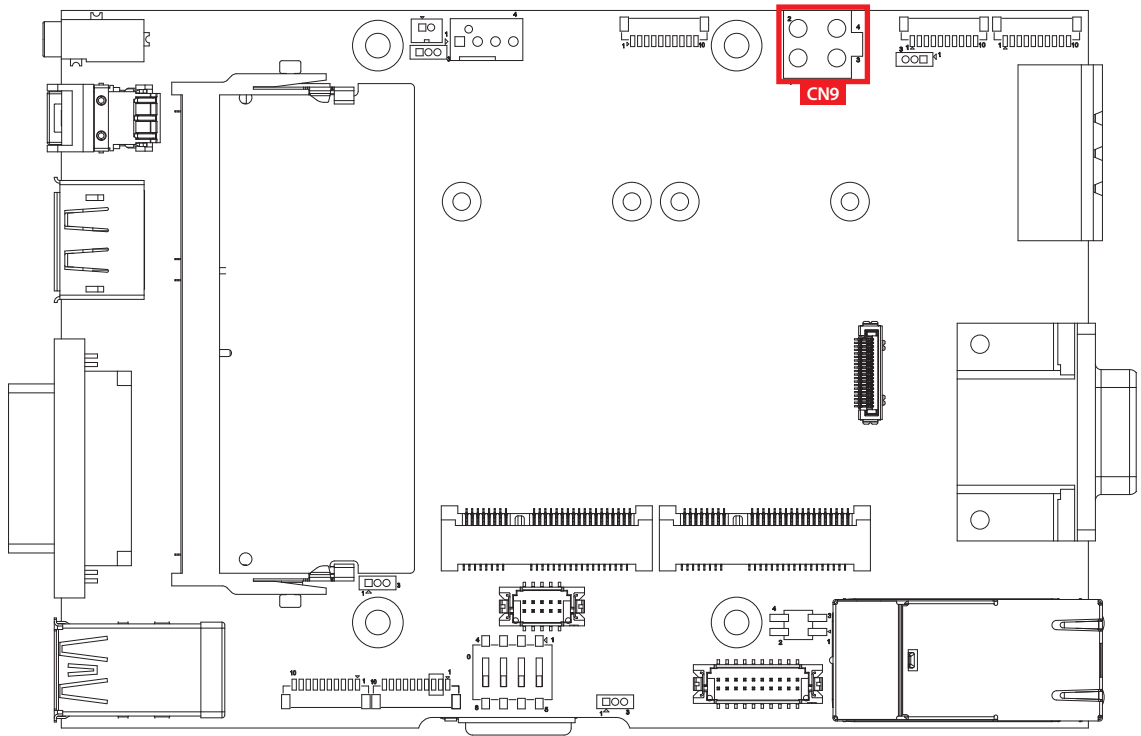
2.4.3 JP2



JP2 is setting as below description, pin1-2 short for GPIO and pin2-3 short for GPI function.

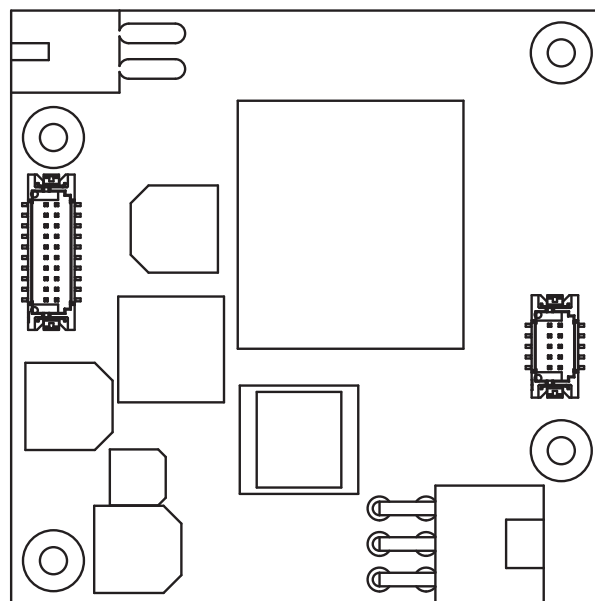
	Pin No.	Description
	1-2	GPIO
	2-3	GPI

2.4.4 CN9



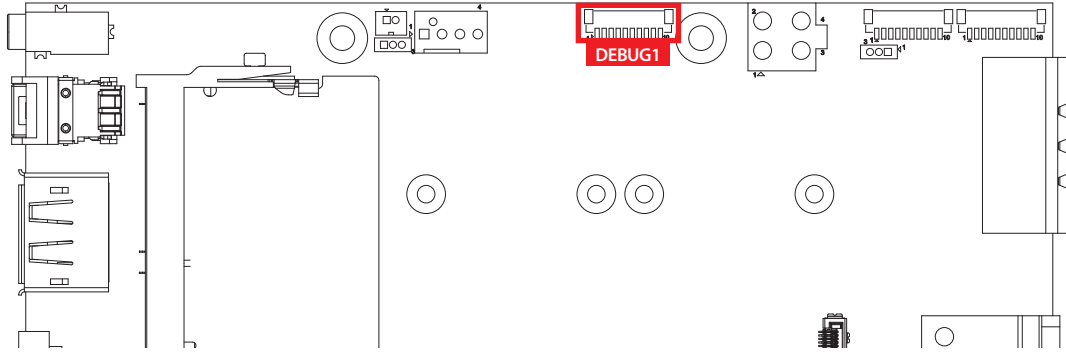
SPC-4500 supports 12V DC power input by wire-to-board connector on the top side.

SPC-4600 can support 9V to 36V input through an additional wide range voltage power board (WPM-100) as below.

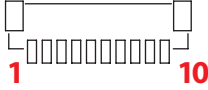


WPM-100

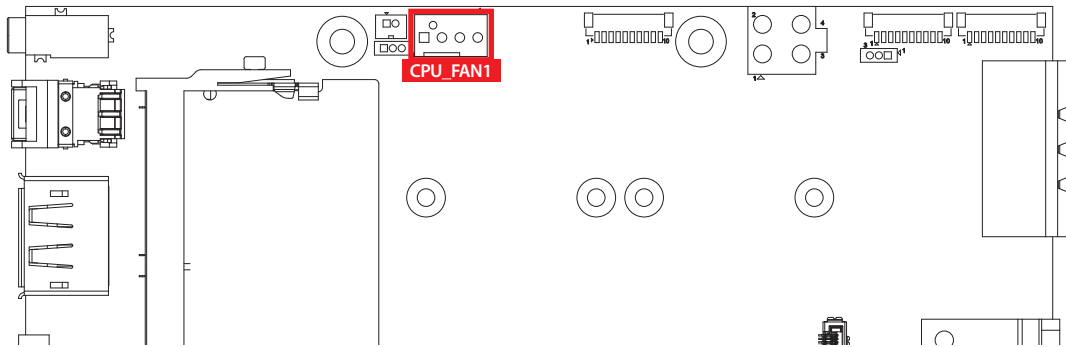
2.4.5 DEBUG1



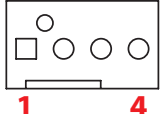
In order to read Port80 information, please use LPC interface to get error message.

	Pin No.	JDIO1 Definition	Pin No.	JDIO1 Definition
	1	3.3V	2	LPC_SERIRQ
	3	LPC_AD0	4	LPC_AD1
	5	LPC_AD2	6	LPC_AD3
	7	LPC_FRAME#	8	CLK_LPC_PORT80
	9	BUF_PLTRST_N_B	10	GND

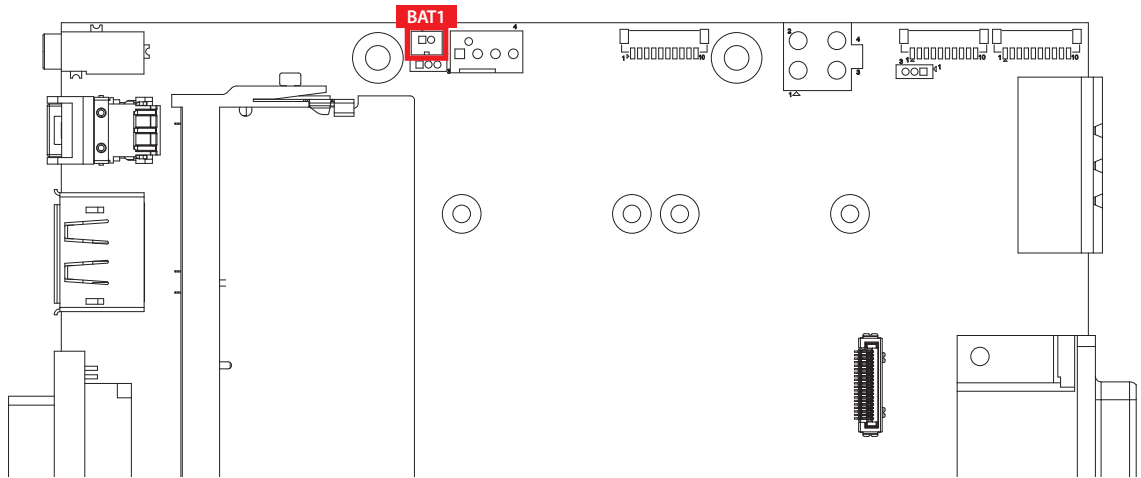
2.4.6 CPU_FAN1



FAN connector supports for higher thermal requirement.

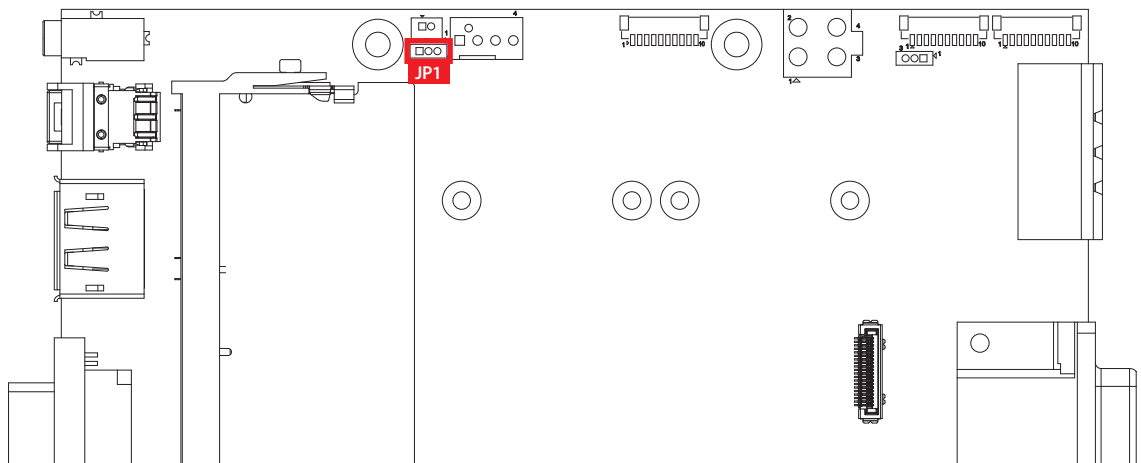
	Pin No.	Definition
	1	GND
	2	+12V
	3	FAN_TAC
4	FAN_CTL	

2.4.7 BAT1



Real-time clock is powered by a lithium battery. It is equipped with Panasonic BR2032 190mAh lithium battery. It is recommended not to replace the lithium battery on your own. If the battery needs to be changed, please contact the Vecow RMA service team.

2.4.8 JP1

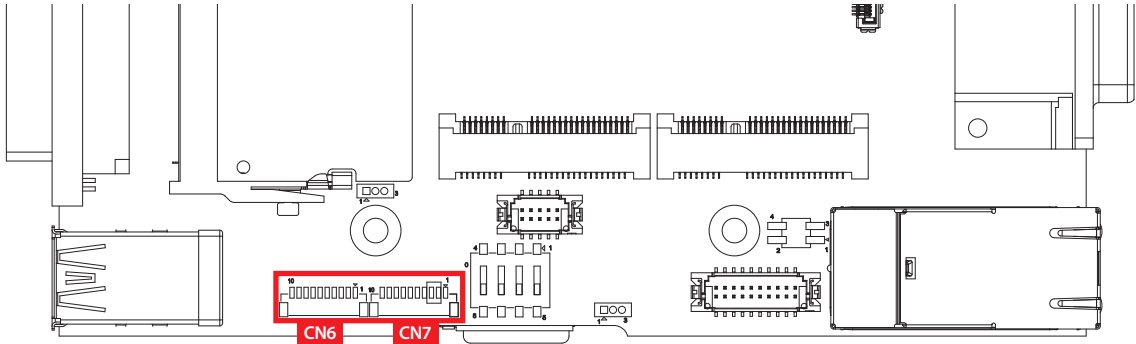


Clear CMOS jumper setting :

JP1 pin1/pin2 closed in normal mode and pin2/pin3 closed for clear CMOS.

	Pin No.	Header
	1	Normal (Default)
	2	Clear CMOS

2.4.9 CN6/CN7



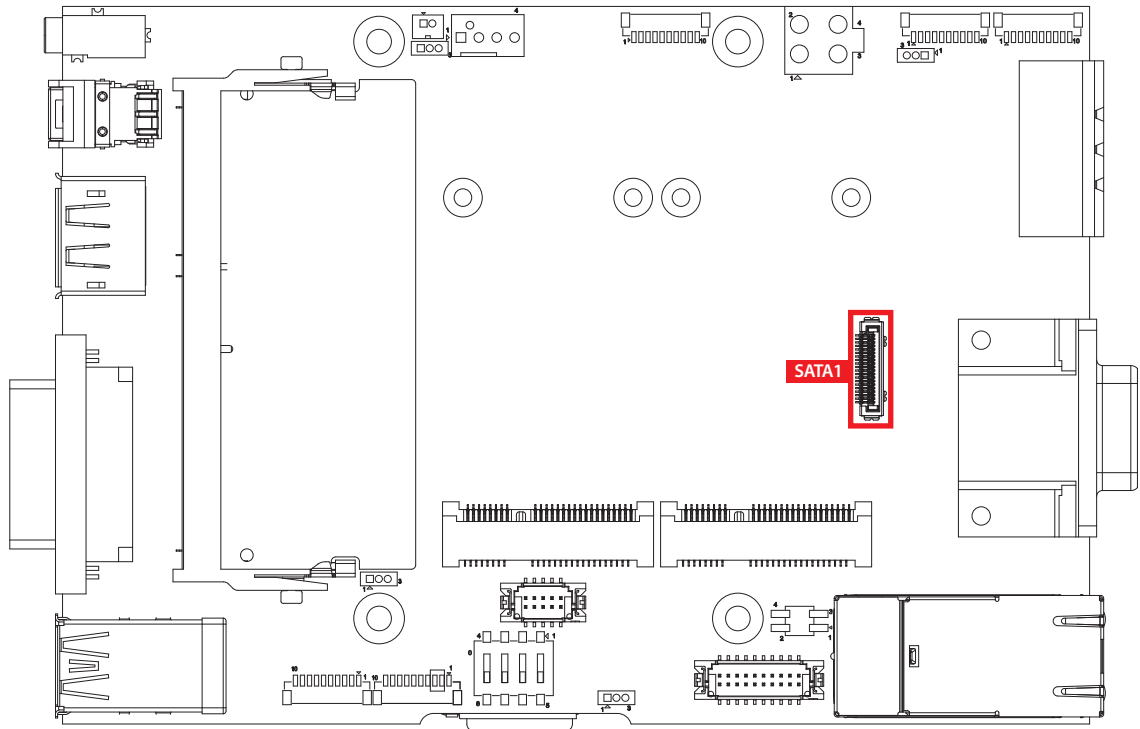
Serial port 3 (CN6) & port4 (CN7) can be configured into RS-232, RS-422, or RS-485 with auto flow control communication. The default definition of COM 1 to COM 4 is RS-232. If you want to change to RS-422 or RS-485, please find the setting in BIOS.

BIOS Setting	Function
COM 3 (CN6) COM 4 (CN7)	RS-232
	RS-422 (5-wire)
	RS-422 (9-wire)
	RS-485
	RS-485 w/z auto-flow control

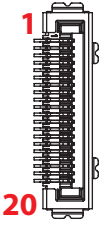
COM3/COM4 pin assignments are listed in the following table :

Serial Port	Pin No.	RS-232	RS-422 (5-wire)	RS-422 (9-wire)	RS-485 (3-wire)
3, 4	1	GND_EARTH	GND_EARTH	GND_EARTH	GND_EARTH
	2	GND	GND	GND	GND
	3	RI	-----	CTS-	RI
	4	DTR	RXD-	RXD-	-----
	5	CTS	-----	CTS+	-----
	6	TXD	RXD+	RXD+	-----
	7	RTS	-----	RTS+	-----
	8	RXD	TXD+	TXD+	DATA+
	9	DSR	-----	RTS-	-----
	10	DCD	TXD-	TXD-	DATA-

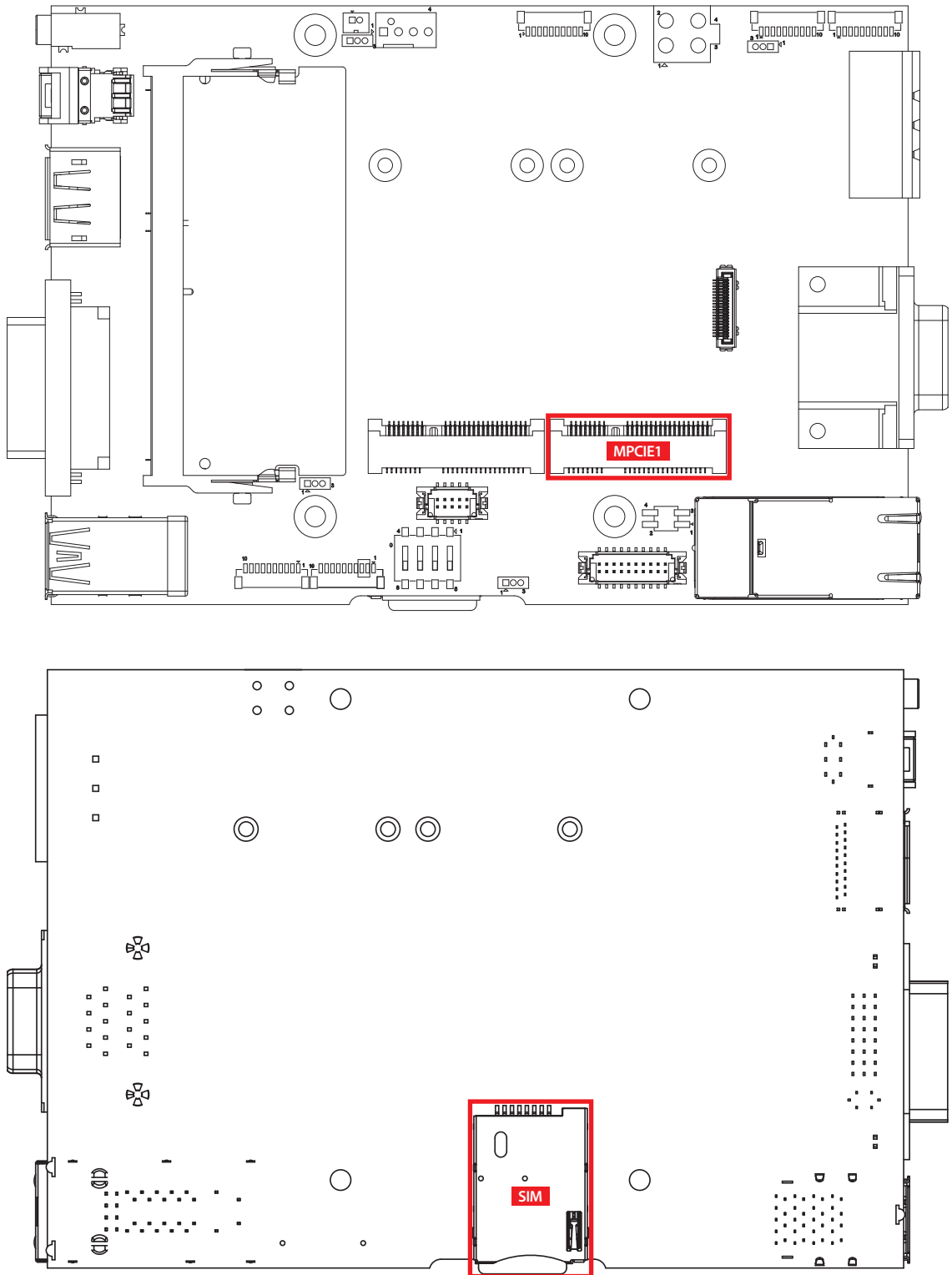
2.4.10 SATA1 III Connector



It supports higher storage capacity with less cabling effort and smaller required space and the pin assignment listed in the following table :

	Pin No.	Definition	Pin No.	Definition
	1	GND	2	GND
	3	GND	4	GND
	5	GND	6	NC
	7	NC	8	5V
	9	5V	10	5V
	11	5V	12	GND
	13	GND	14	GND
	15	SATA_RXP0	16	SATA_RXN0
	17	GND	18	SATA_TXN0
19	SATA_TXP0	20	GND	

2.4.11 MPCIE1/SIM (CN8) Connector

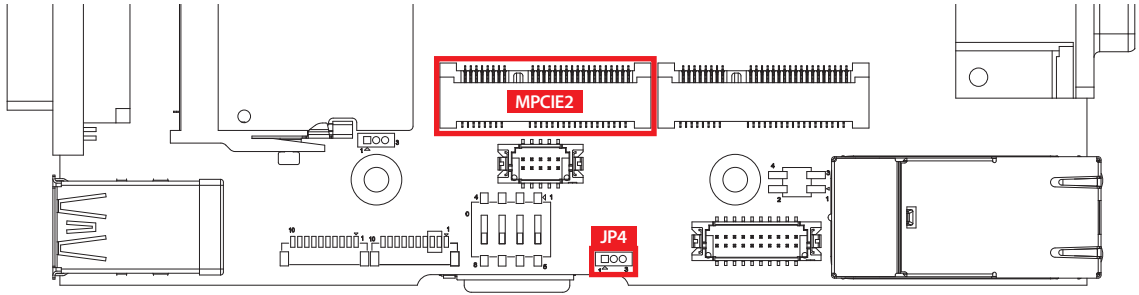


Note : The SIM card sockets do not support hot-plug. Please make sure to unplug the system power before inserting the SIM card(s).

The pin assignments of MPCIE1 are listed in the following table :

Pin No.	Signal Name	Pin No.	Signal Name
51	Reserved	52	+3.3Vaux
49	Reserved	50	GND
47	Reserved	48	+1.5V
45	Reserved	46	Reserved
43	GND	44	Reserved
41	+3.3Vaux	42	Reserved
39	+3.3Vaux	40	GND
37	GND	38	USB_D+
35	GND	36	USB_D-
33	PETp0	34	GND
31	PETn0	32	SMB_DATA
29	GND	30	SMB_CLK
27	GND	28	+1.5V
25	PERp0	26	GND
23	PERn0	24	+3.3Vaux
21	GND	22	PERST#
19	Reserved	20	reserved
17	Reserved	18	GND
Mechanical Key			
15	GND	16	UIM_VPP
13	REFCLK+	14	UIM_RESET
11	REFCLK-	12	UIM_CLK
9	GND	10	UIM_DATA
7	CLKREQ#	8	UIM_PWR
5	Reserved	6	1.5V
3	Reserved	4	GND
1	WAKE#	2	3.3Vaux

2.4.12 MPCIE2/JP4



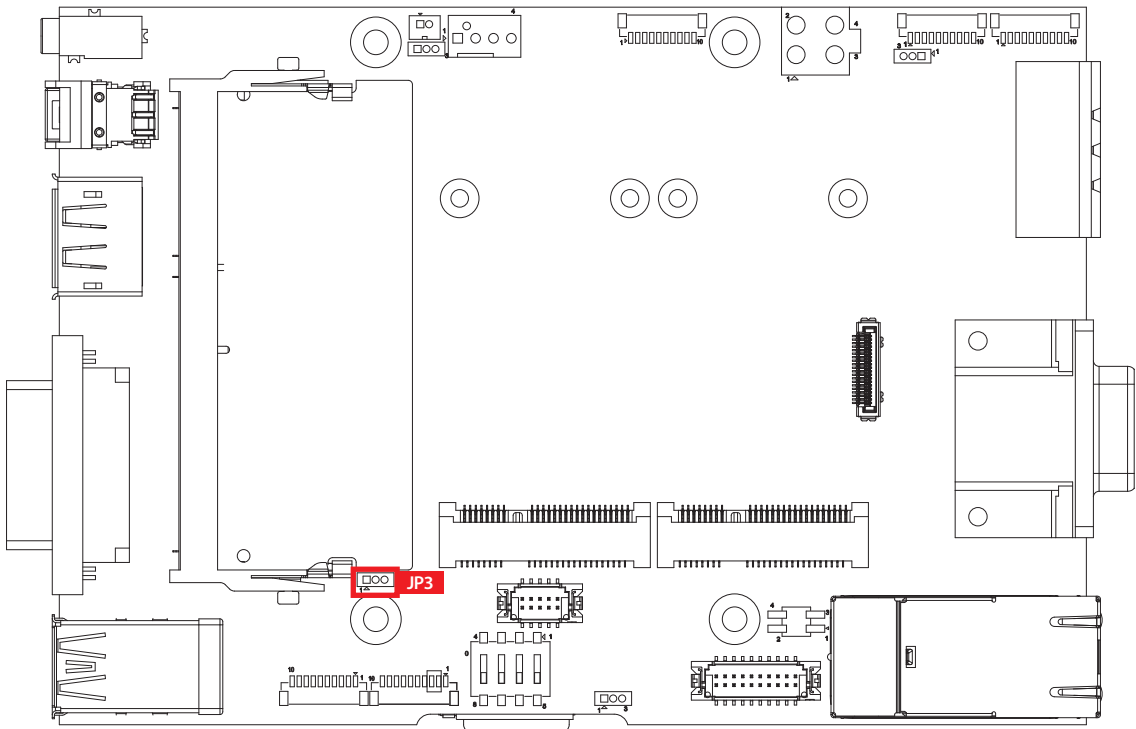
Both mSATA and MPCIE2 share the same form factor and similar electrical pinout assignments on the connectors. You can select to have mSATA or Mini PCIe by JP4. The pin assignments of MPCIE2 and JP4 are listed in the following table :


	Pin No.	Function
	1-2	mSATA
	2-3/NC	Mini PCIe

Pin No.	Signal Name	Pin No.	Signal Name
51	Reserved	52	+3.3Vaux
49	Reserved	50	GND
47	Reserved	48	+1.5V
45	Reserved	46	Reserved
43	Status	44	Reserved
41	+3.3Vaux	42	Reserved
39	+3.3Vaux	40	GND
37	GND	38	USB_D+
35	GND	36	USB_D-
33	PETp0	34	GND
31	PETn0	32	SMB_DATA
29	GND	30	SMB_CLK
27	GND	28	+1.5V
25	PERp0	26	GND
23	PERn0	24	+3.3Vaux
21	GND	22	PERST#
19	Reserved	20	reserved
17	Reserved	18	GND

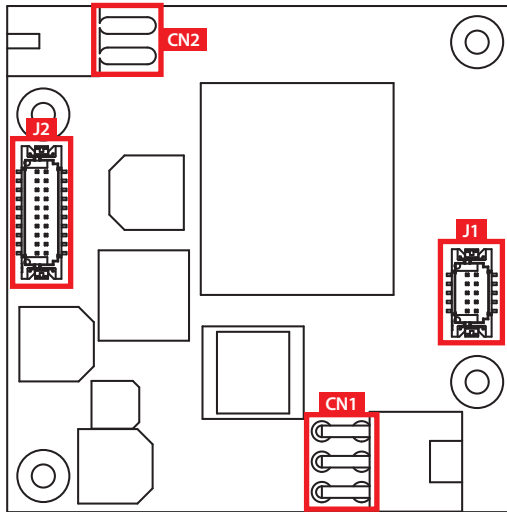
Pin No.	Signal Name	Pin No.	Signal Name
Mechanical Key			
15	GND	16	UIM_VPP
13	REFCLK+	14	UIM_RESET
11	REFCLK-	12	UIM_CLK
9	GND	10	UIM_DATA
7	CLKREQ#	8	UIM_PWR
5	Reserved	6	1.5V
3	Reserved	4	GND
1	WAKE#	2	3.3Vaux

2.4.13 JP3 USB Power Select



	Pin No.	Function
3  1	1-2	+5V standby power
	2-3	+5V system power

2.4.14 WPM-100 Wide-Range Power Board



Only SPC-4600 with WPM-100 daughter board can support wide range power input (9V-36V), ignition control, and POE function. CN1 is wide range input. CN2 is DC 12V output and connects to SPC-4600 mainboard CN9 connector.

J1 is ignition signals and connects to SPC-4600's IGN1 connector. J2 is POE signals and connects to SPC-4600's POE_1 connector. The pin assignments of WPM-100's CN1, CN2, J1 and J2 are listed in the following table :

CN1

Pin No.	Function
1	VIN
2	VIN
3	VIN
4	GND
5	GND
6	GND

CN2

Pin No.	Function
1	GND
2	GND
3	12V
4	12V

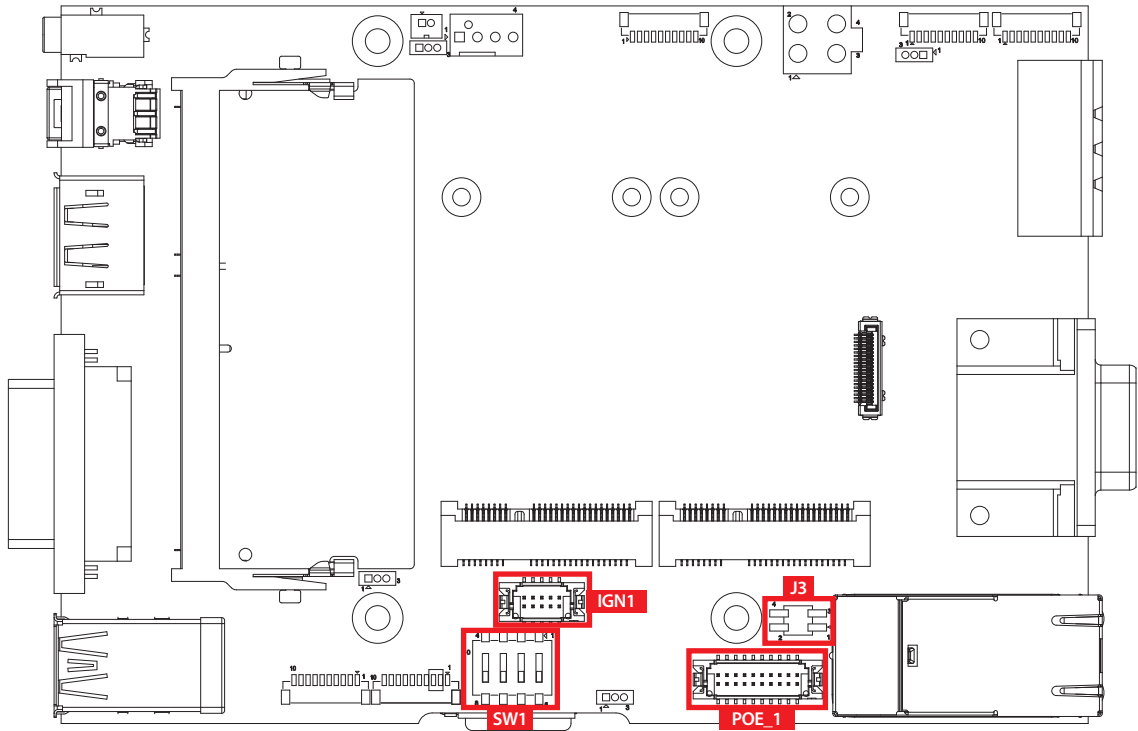
J1

Pin No.	Signal Name	Pin No.	Signal Name
1	+V3.3_MCU	2	GND
3	+V3.3_MCU	4	GND
5	GND	6	LM_EN
7	VIN_DET	8	+V5_EARLY_EN
9	GND	10	+V5_EARLY

J2

Pin No.	Signal Name	Pin No.	Signal Name
1	VEE_LAN1	2	VEE_LAN2
3	VEE_LAN1	4	VEE_LAN2
5	VEE_LAN1	6	VEE_LAN2
7	GND_POE	8	GND_POE
9	GND_POE	10	GND_POE
11	GND_POE	12	GND_POE
13	POE_LED_LAN1	14	POE_LED_LAN2
15	NC	16	NC
17	3.3V	18	GND
19	S_SMB_DATA	20	S_SMB_CLK

2.4.15 SW1/IGN1/POE_1/J3



These 3 connectors (SW1, IGN1, POE_1) are only for SPC-4600 through an additional board (WPM-100) to support

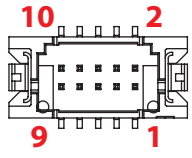
1. Wide range DC input (9V~36V)
2. Ignition function
3. POE function

The pin assignments of SPC-4600's SW1, IGN1, POE_1 and J3 are listed in the following table :

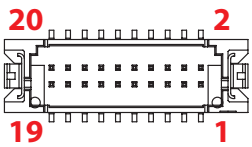
SW1

	Pin No.	Signal Name	Pin No.	Signal Name
	1	ROTARY_SW_IN0	2	ROTARY_SW_IN1
	3	ROTARY_SW_IN2	4	ROTARY_SW_IN3
	5	GND	6	GND
	7	GND	8	GND
	9	GND	10	+V5_EARLY

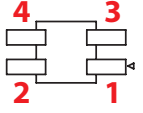
IGN1

	Pin No.	Signal Name	Pin No.	Signal Name
	1	+V3.3_MCU	2	GND
	3	+V3.3_MCU	4	GND
	5	GND	6	LM_EN
	7	VIN_DET	8	+V5_EARLY_EN
	9	GND	10	+V5_EARLY

POE_1

	Pin No.	Signal Name	Pin No.	Signal Name
	1	VEE_LAN1	2	VEE_LAN2
	3	VEE_LAN1	4	VEE_LAN2
	5	VEE_LAN1	6	VEE_LAN2
	7	GND_POE	8	GND_POE
	9	GND_POE	10	GND_POE
	11	GND_POE	12	GND_POE
	13	POE_LED_LAN1	14	POE_LED_LAN2
	15	NC	16	NC
	17	3.3V	18	GND
	19	S_SMB_DATA	20	S_SMB_CLK

J3 (Ignition firmware update connector)

	Pin No.	Signal Name	Pin No.	Signal Name
	1	GND	2	MCU_RST#
	3	+V3.3_MCU	4	MCU_PRG

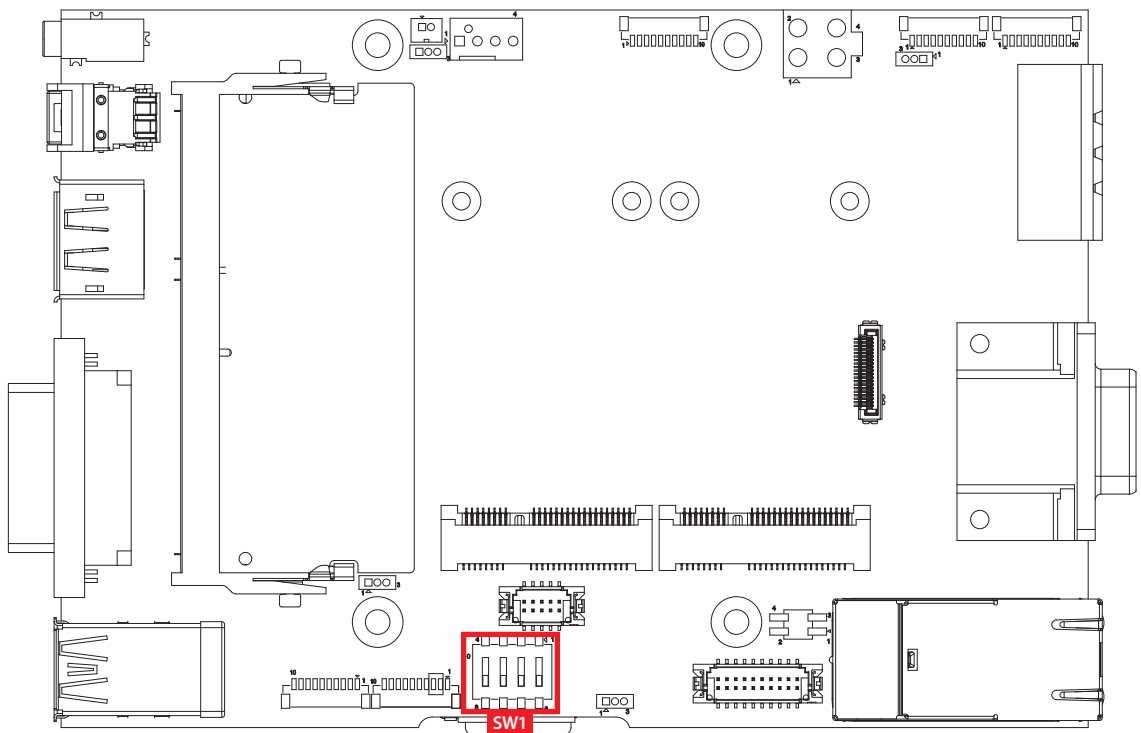
2.4.16 Ignition Control

SPC-4600 provides ignition power control feature for in-vehicle applications. The built-in MCU monitors the ignition signal and turns on/off the system according to pre-defined on/off delay period.

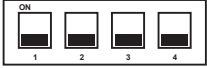
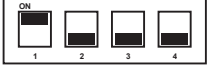
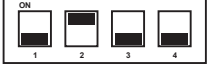
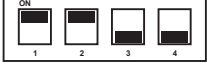
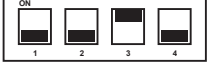
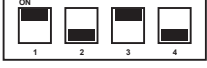
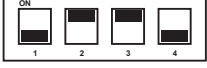
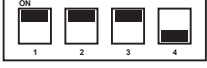
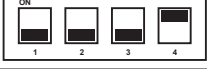



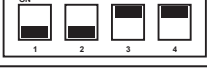
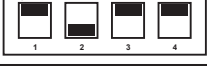
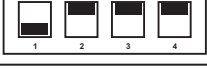
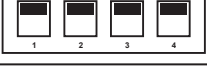
2.4.16.1 Adjust Ignition Control Modes

SPC-4600 provides 16 modes of different power on/off delay periods adjustable via SW1 switch. The default rotary switch is set to 0 in ATX/AT power mode.

SW1 : Ignition Control



The modes are listed in below table :

Deep Switch Position	Power on delay	Power off delay	Switch Position
0	ATX/AT mode (Default)		
1	No delay	No delay	
2	No delay	5 seconds	
3	No delay	10 seconds	
4	No delay	20 seconds	
5	5 seconds	30 seconds	
6	5 seconds	60 seconds	
7	5 seconds	90 seconds	
8	5 seconds	30 minutes	
9	5 seconds	1 hour	
A	10 seconds	2 hours	
B	10 seconds	4 hours	
C	10 seconds	6 hours	
D	10 seconds	8 hours	
E	10 seconds	12 hours	
F	10 seconds	24 hours	

2.4.16.2 Ignition Control Wiring

To activate ignition control, you need to provide IGN signal via the 3-pin pluggable terminal block locates in the back panel. Please find below the general wiring configuration.

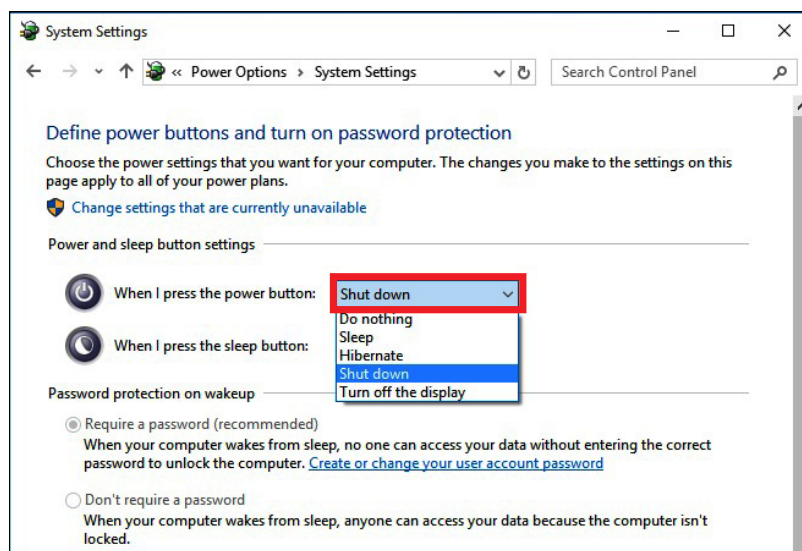


Pin No.	Definition
1	Ignition
2	SW+
3	SW-

For testing purpose, you can refer to the picture blow to simulate ignition signal input controlled by a latching switch.

Note :

1. DC power source and IGN share the same ground.
2. SPC-4600 supports 9V to 36V wide range DC power input in ATX/AT mode. In Ignition mode, the input voltage is fixed to 12V/24V for car battery scenario.
3. For proper ignition control, the power button setting should be "Power Down" mode.



In Windows for example, you need to set "When I press the power button" to Shut down.

3

SYSTEM SETUP

3.1 How to Open Your SPC-4500 Series

3.1.1 SPC-4500

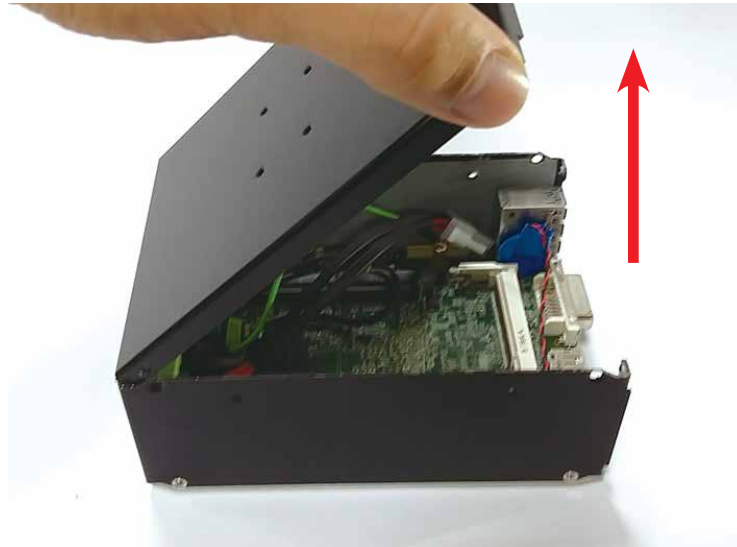
Step 1 Turn SPC-4500 bottom side up to remove two M3 screws.



Step 2 Remove the other two M3 screws.



Step 3 Remove the bottom cover.



3.1.2 SPC-4600

Step 1 Turn SPC-4600 bottom side up to remove two M3 screws.



Step 2 Remove the other two M3 screws.

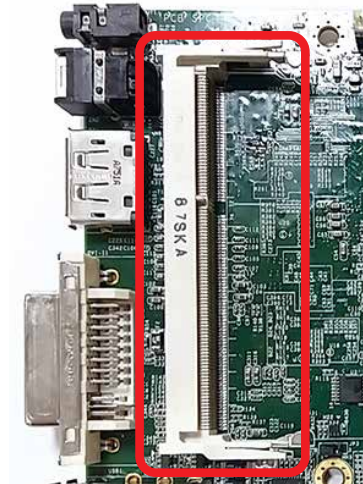


Step 3 Remove the bottom cover.



3.2 Installing DDR3L Module

Step 1 Find DDR3L SO-DIMM socket.



Step 2 Install DDR3L RAM module into SO-DIMM socket.

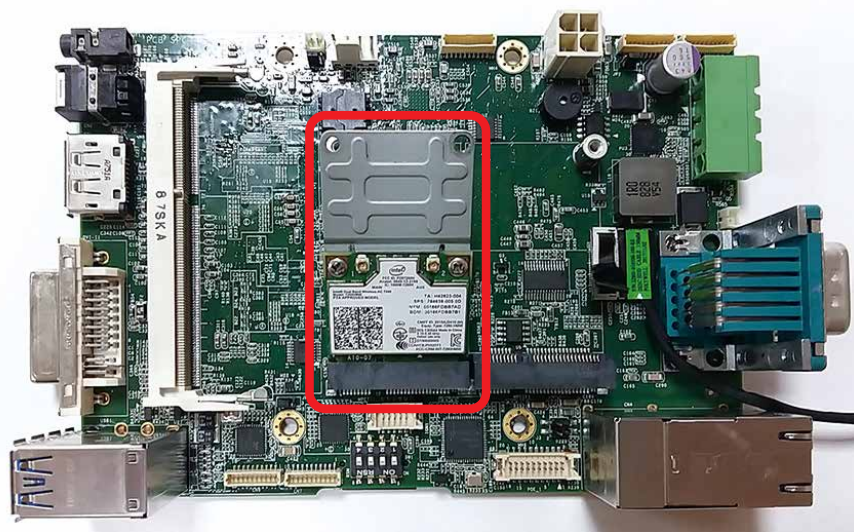


Step 3 Finished.



3.3 Installing Mini PCIe Card

Step 1 Find Mini PCIe socket.



Step 2 Fasten a PHILLIPS M2.5 screw.



3.4 Installing Antenna Cable

Step 1 Check antenna cable, washer and nut.



Step 2 Install antenna cable and then fasten washer and nut.

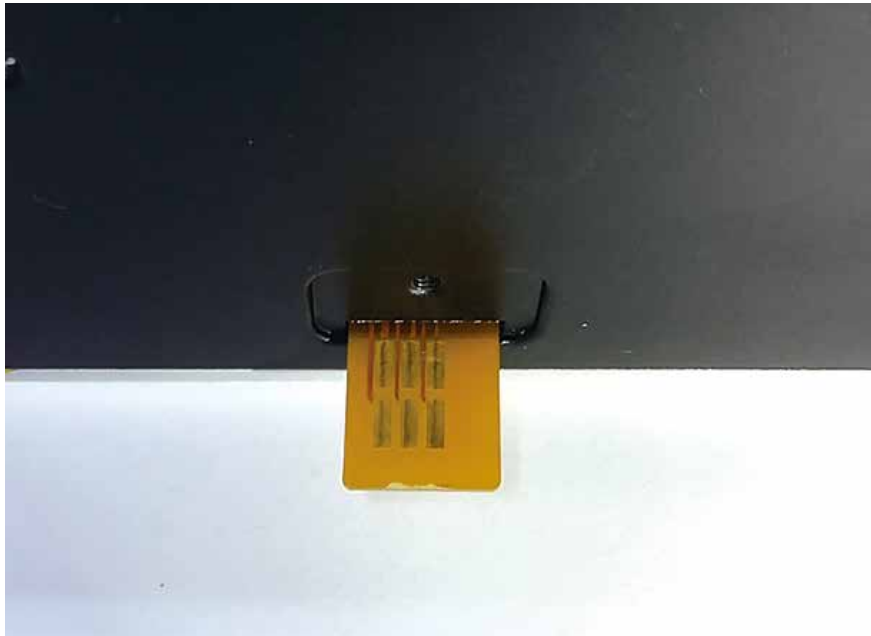


3.5 Installing SIM Card

Step 1 Open SIM card cover.



Step 2 Install SIM card and close the cover.



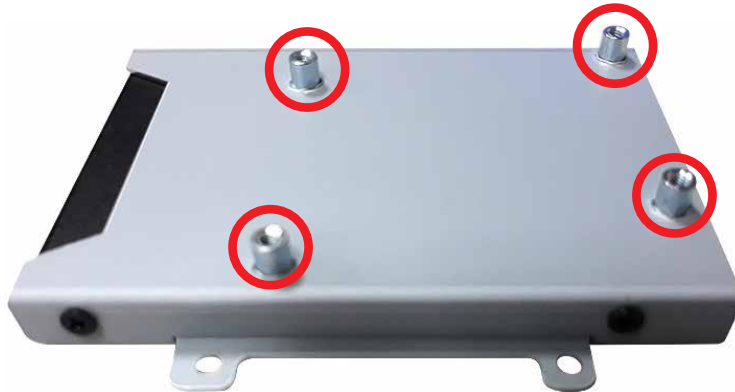
3.6 Installing SSD/HDD

3.6.1 SPC- 4500 SSD/HDD

Step 1 Put SSD/HDD in the HDD Tray.



Step 2 Fasten M3 screws.



3.6.2 SPC- 4600 SSD/HDD

Step 1 Put SSD/HDD in the HDD Tray.

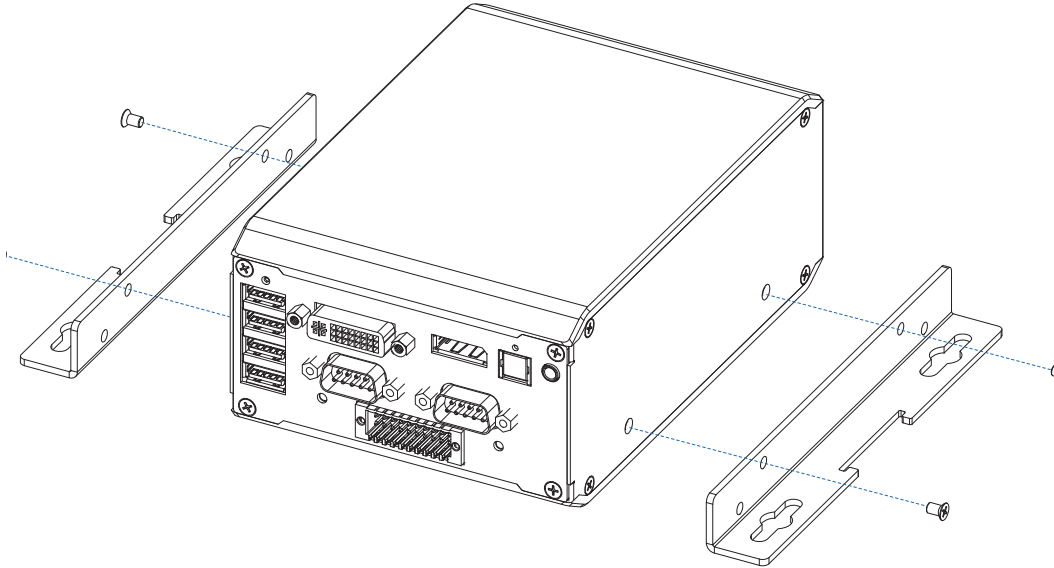


Step 2 Fasten M3 screws.

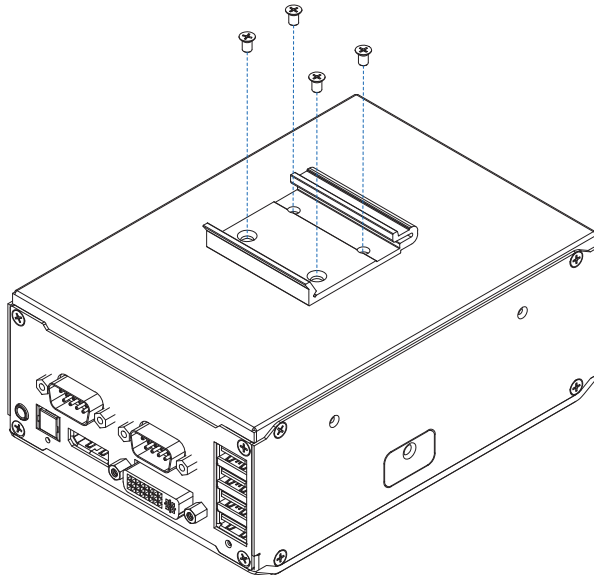


3.7 Mounting Your SPC-4500

3.7.1 Wall mount



3.7.2 Din Rail



4

BIOS SETUP

4.1 Entering Setup

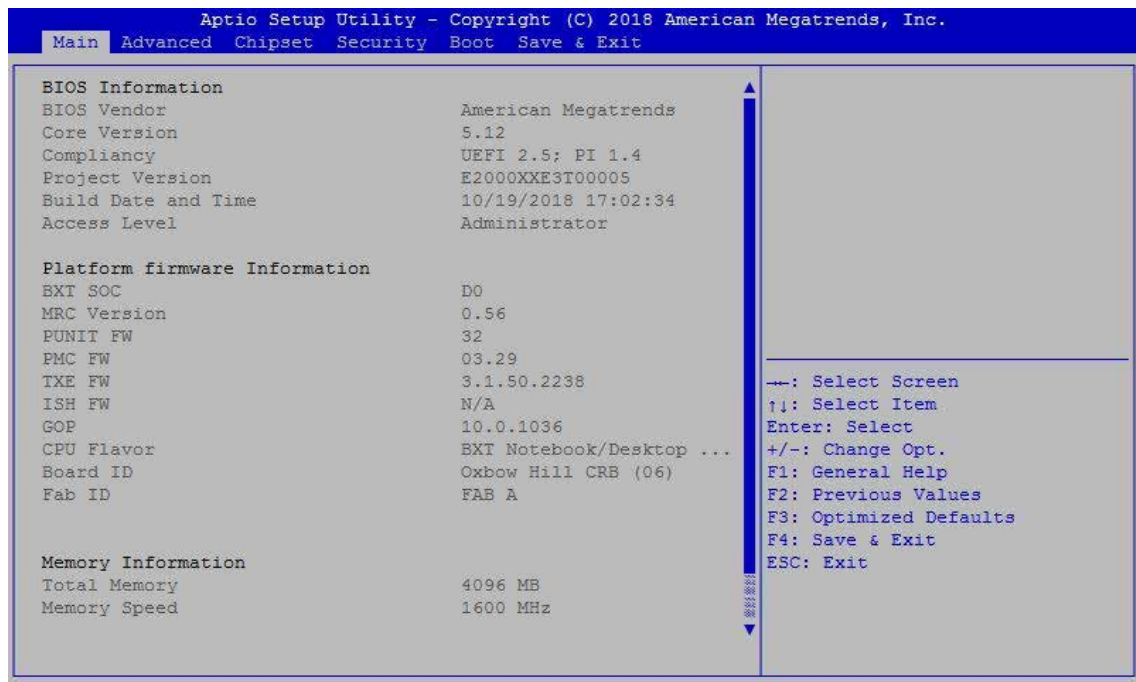


Figure 4-1 : Entering Setup Screen

BIOS provides an interface for users to check and change system configuration. The BIOS setup program is accessed by pressing the key when POST display output is shown.

4.2 Main Menu

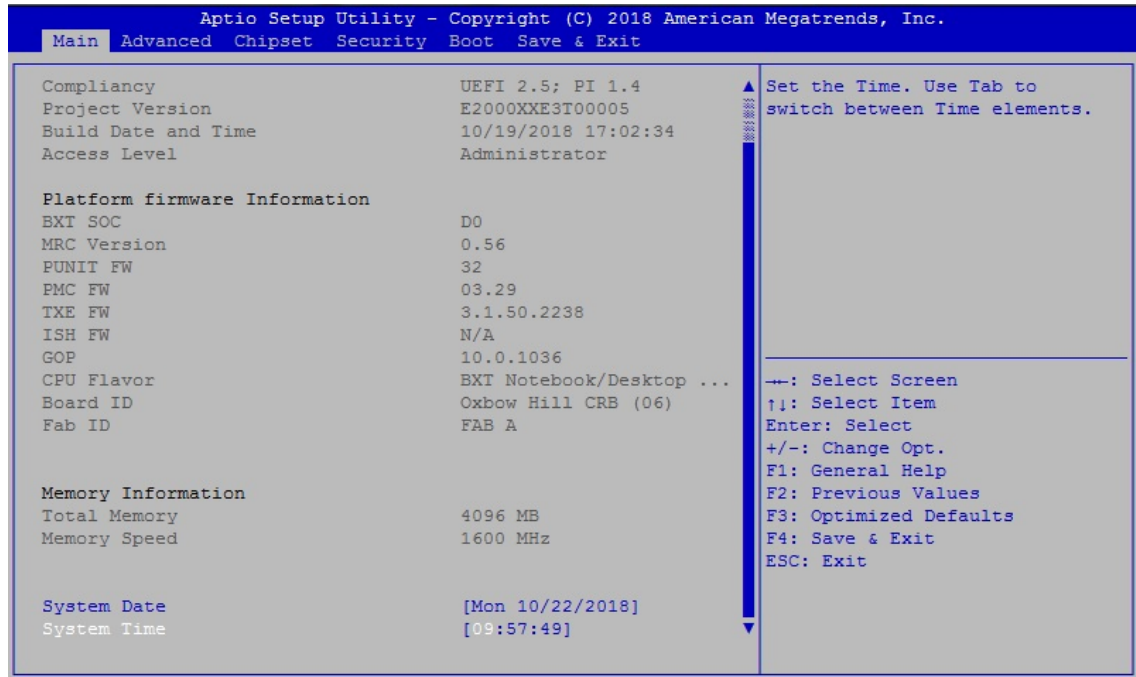


Figure 4-2 : BIOS Main Menu

The Main menu displays BIOS version and system information. There are two options on Main menu.

System Data

Set the date. Use <Tab> to switch between date elements.

System Time

Set the time. Use <Tab> to switch between time elements.

4.3 Advanced

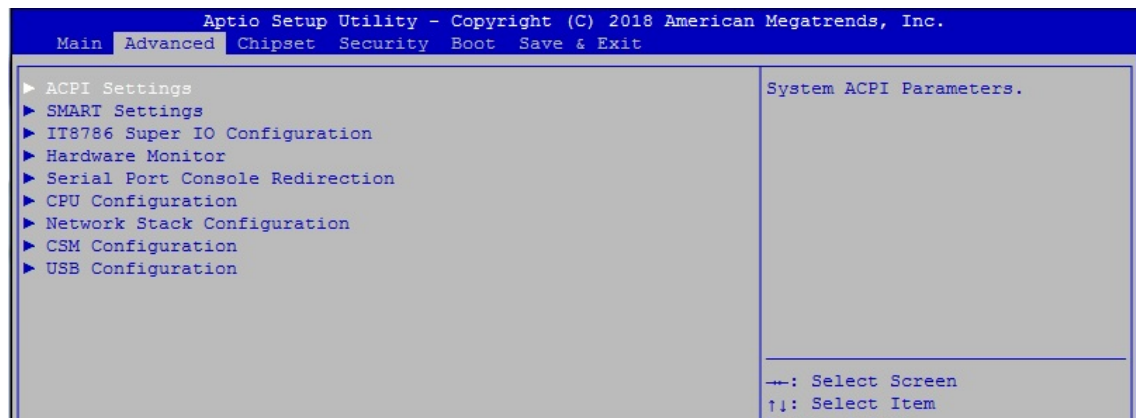


Figure 4-3 : BIOS Advanced menu

Select advanced tab to enter advanced BIOS setup options, such as CPU configuration, Network configuration, and USB configuration.

4.3.1 ACPI Settings

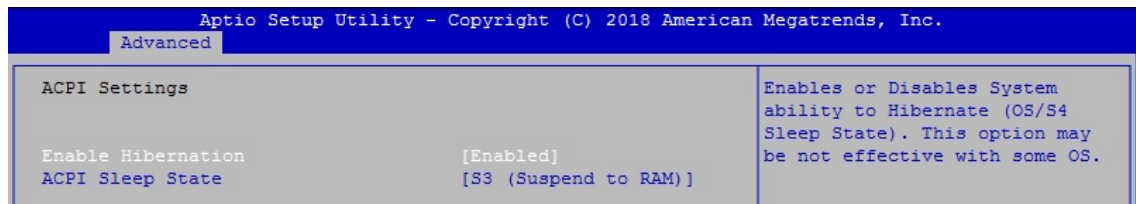


Figure 4-3-1 : ACPI Settings

Enable Hibernation

Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS.

ACPI Sleep State

Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed.

4.3.2 SMART Settings

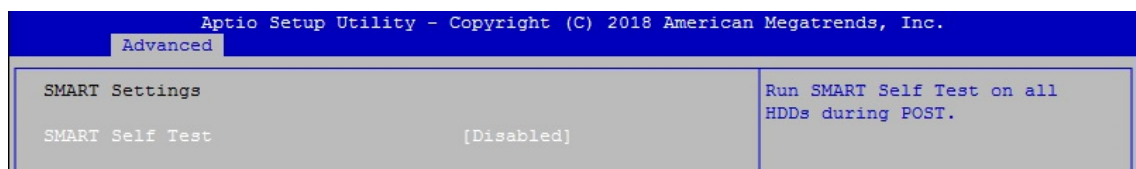


Figure 4-3-2 : SMART Settings

SMART Self Test

Run SMART Self Test on all HDDs during POST.

4.3.3 IT8786 Super IO Configuration

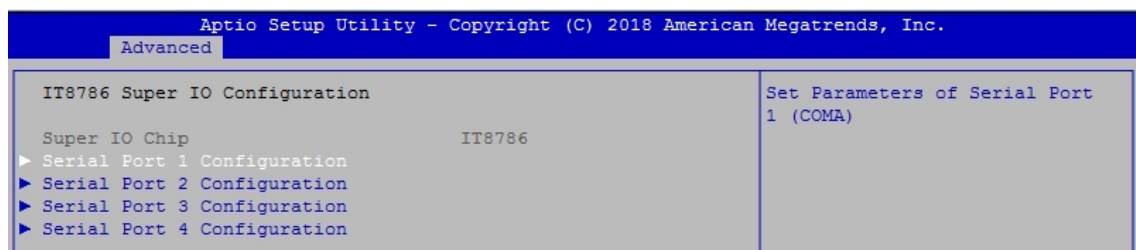


Figure 4-3-3-1 : Super IO Settings

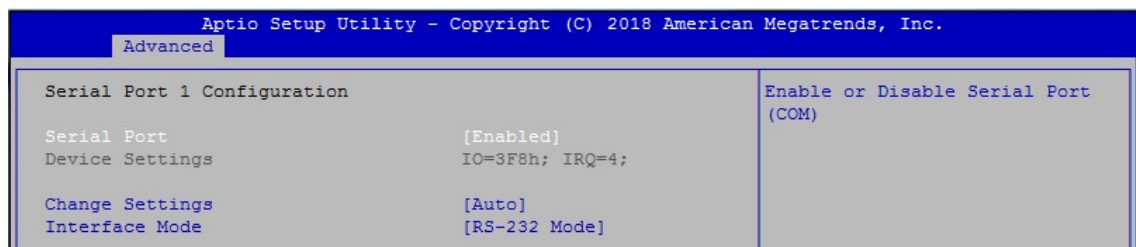


Figure 4-3-3-2 : Super IO Serial Port Configuration

Serial Port 1 to port 4 Configuration

Options for Serial Port 1 to Serial Port 4.

Entering the corresponding Port option then end user can change the settings such as I/O resource and UART mode.

4.3.4 Hardware Monitor

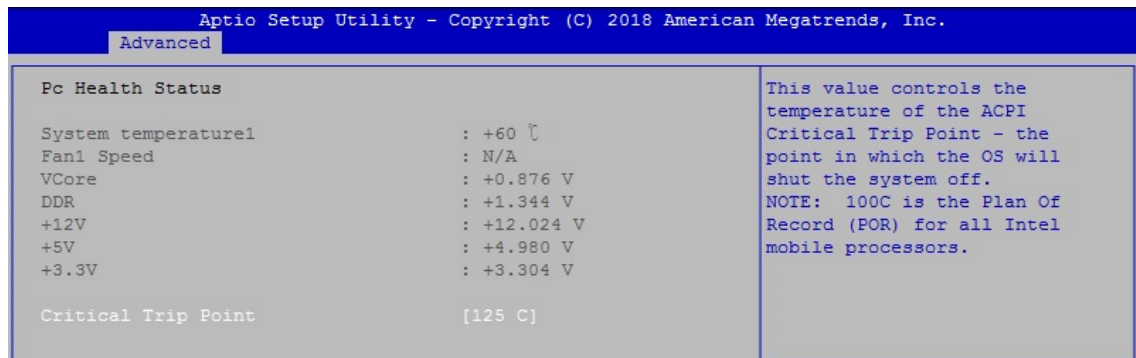


Figure 4-3-4 : Hardware Monitor Settings

The IT8786 SIO features an enhanced hardware monitor providing thermal, fan speed, and system voltage's status monitoring.

Critical trip Point

This value controls the temperature of the ACPI Critical Trip Point - the point in which the OS will shut the system off.

4.3.5 Serial Port Console Redirection

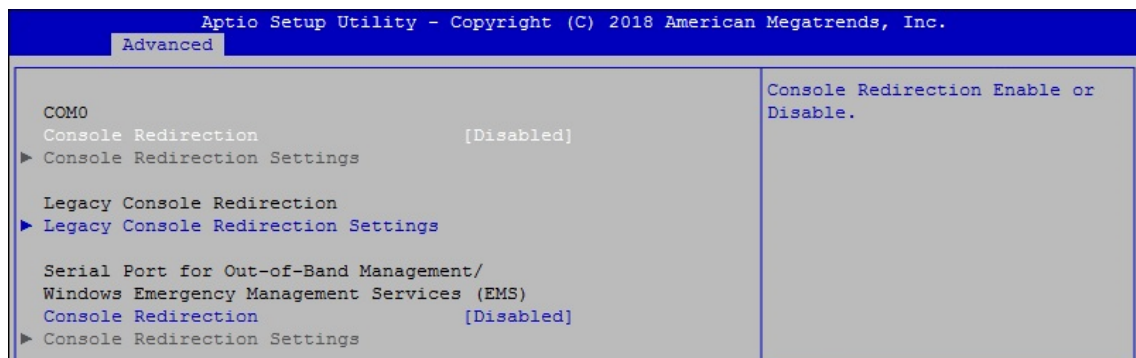


Figure 4-3-5 : Serial Port Console Redirection Settings

Console Redirection

Console Redirection Enable or Disable.

Console Redirection Settings

The settings specify how the host computer and the remote computer (which the user is using) will exchange data. Both computers should have the same or compatible settings.

Legacy Console Redirection

Legacy Console Redirection Settings.

Serial Port for Out-of-Band Management/Windows Emergency Management Services (EMS)

Console redirection enable or disable.

4.3.6 CPU Configuration

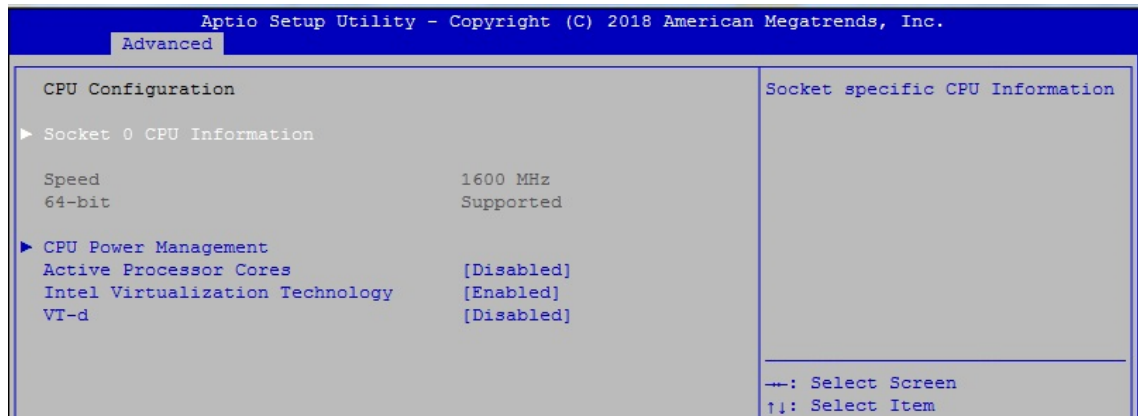


Figure 4-3-6-1 : CPU Configuration

Active Processor Cores

Enable this to disable core in each processor package.

Intel Virtualization Technology

When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.

VT-d

Enable/Disable CPU VT-d.

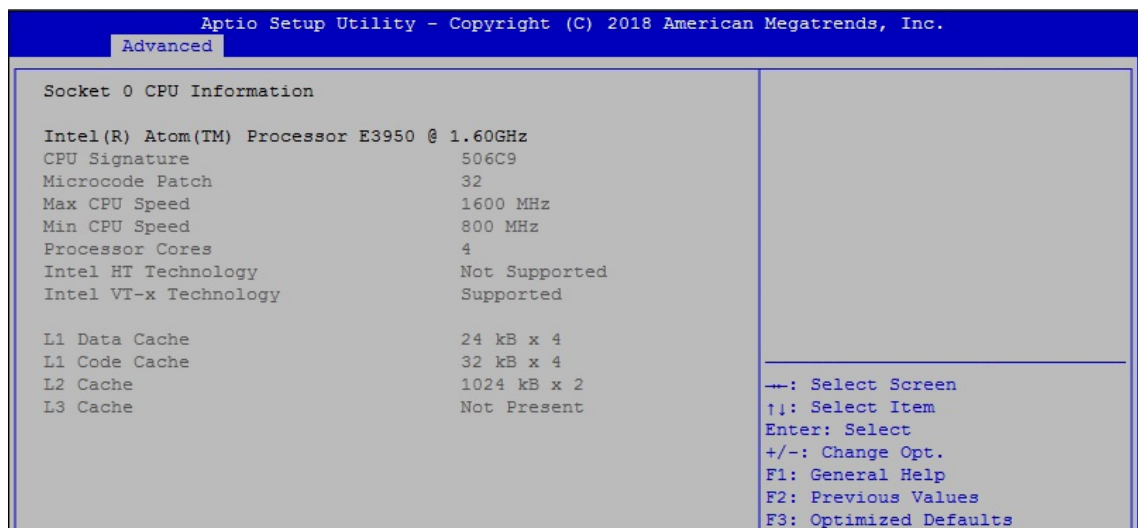


Figure 4-3-6-2 : CPU Information

Socket specific CPU Information.

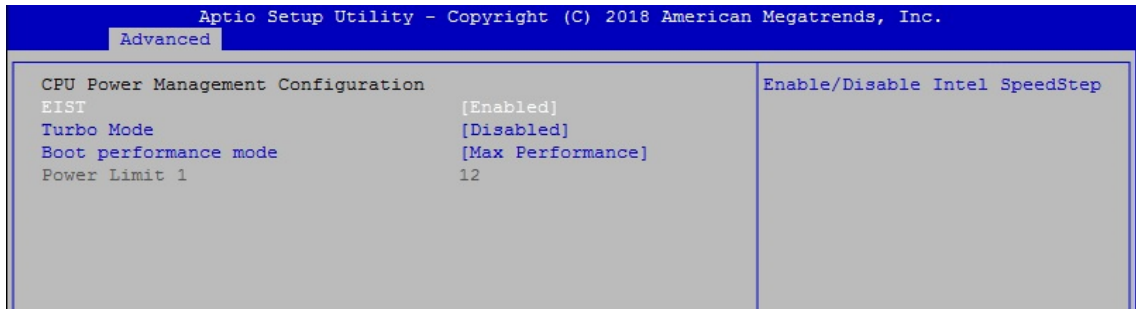


Figure 4-3-6-3 : CPU Power Management

EIST

Enable/Disable Intel SpeedStep.

Turbo Mode

Turbo Mode.

Boot performance mode

Select the performance state that the BIOS will set before OS handoff.

4.3.7 Network Stack Configuration

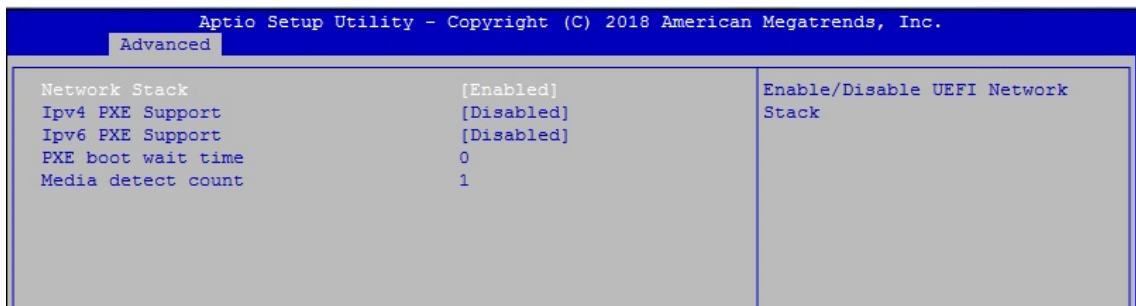


Figure 4-3-7 : Network Stack Settings

Network Stack

Enable/Disable UEFI Network Stack.

Ipv4 PXE Support

Enable Ipv4 PXE Boot Support. If disabled IPV4 PXE boot option will not be created.

Ipv6 PXE Support

Enable Ipv6 PXE boot Support. If disabled IPV6 PXE boot option will not be created.

PXE boot wait time

Wait time to press ESC key to abort the PXE boot.

Media detect count

Number of times presence of media will be checked.

4.3.8 CSM Configuration

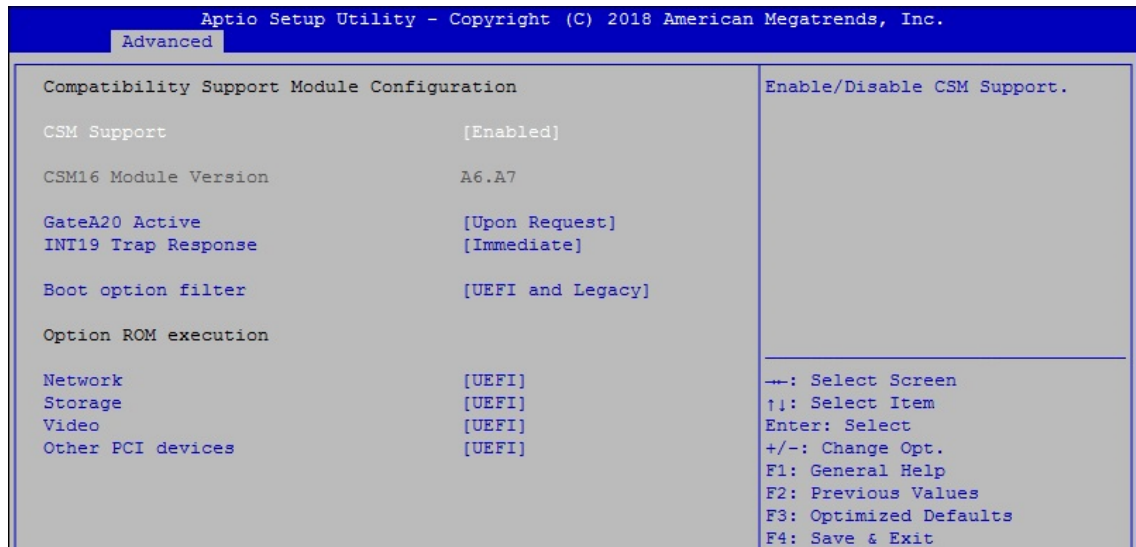


Figure 4-3-8 : CSM Settings

CSM Support

Enable/Disable CSM support.

GateA20 Active

UPON REQUEST - GA20 can be disabled using BIOS services. ALWAYS - do not allow disabling GA20; this option is useful when any RT code is executed above 1MB.

INT19 Trap Response

BIOS reaction on INT19 trapping by Option ROM : IMMEDIATE - execute the trap right away; POSTPONED - execute the trap during legacy boot.

Boot option filter

This option controls Legacy/UEFI ROMs priority.

Network

Controls the execution of UEFI and Legacy PXE OpROM.

Storage

Controls the execution of UEFI and Legacy Storage OpROM.

Video

Controls the execution of UEFI and Legacy Video OpROM.

Other PCI devices

Determines OpROM execution policy for devices other than Network, Storage, or Video.

4.4 Chipset

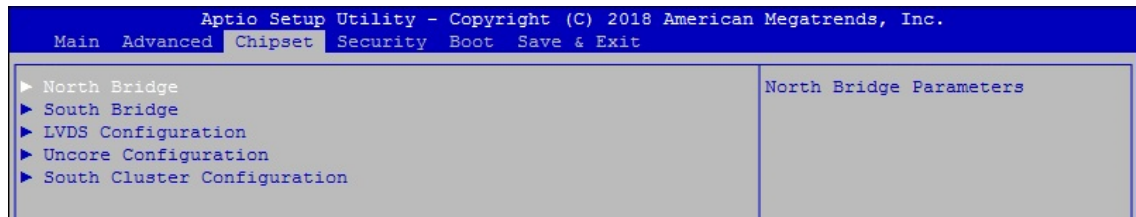


Figure 4-4 : Chipset

North Bridge

North Bridge Parameters.

South Bridge

South Bridge Parameters.

LVDS Configuration

LVDS Configuration.

Uncore Configuration

Uncore Configuration.

South Cluster Configuration

South Cluster Configuration.

4.4.1 North Bridge

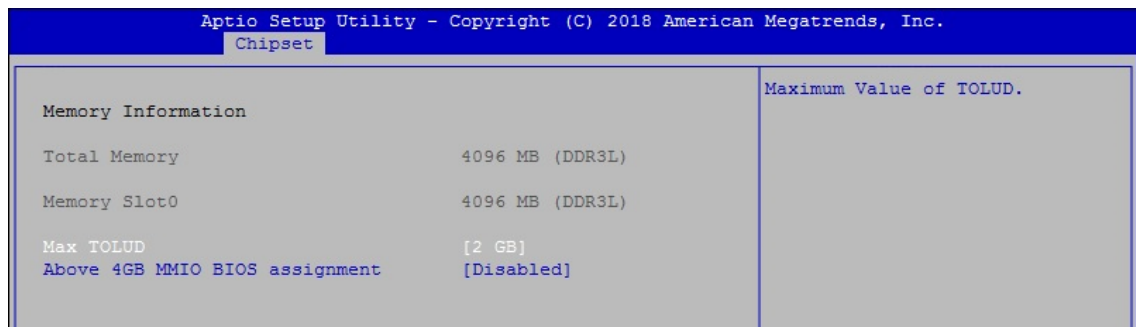


Figure 4-4-1 : North Bridge Settings

Max TOLUD

Maximum Value of TOLUD.

Above 4GB MMIO BIOS assignment

Enable/Disable above 4GB MemoryMappedIO BIOS assignment. This is disabled automatically when Aperture Size is set to 2048MB.

4.4.2 South Bridge

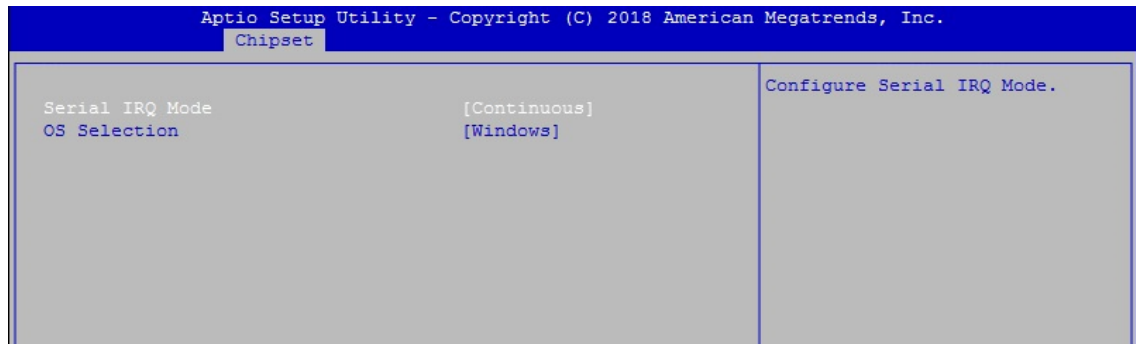


Figure 4-4-2 : South Bridge

Serial IRQ Mode

Configure Serial IRQ Mode.

OS Selection

Select the target OS.

4.4.3 LVDS Configuration

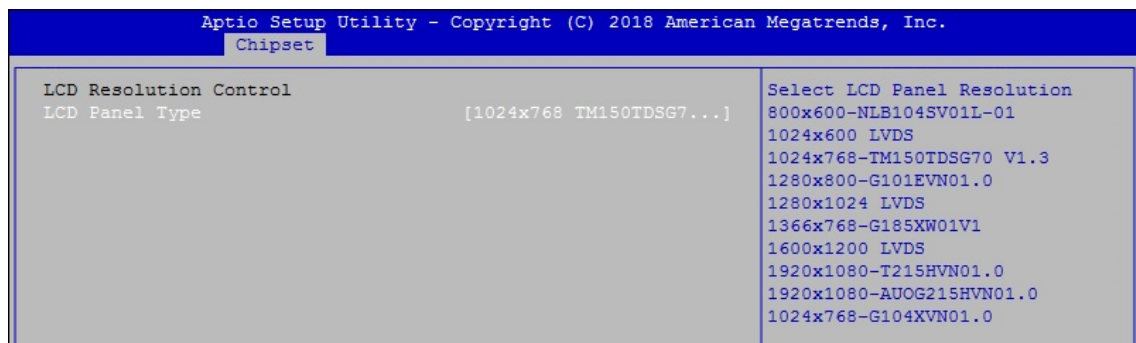


Figure 4-4-3 : LVDS Panel Settings

The LVDS Configuration option will be present if LVDS panel is connected on system.

LCD Panel Type

Select LCD Panel Resolution.

4.4.4 Uncore Configuration

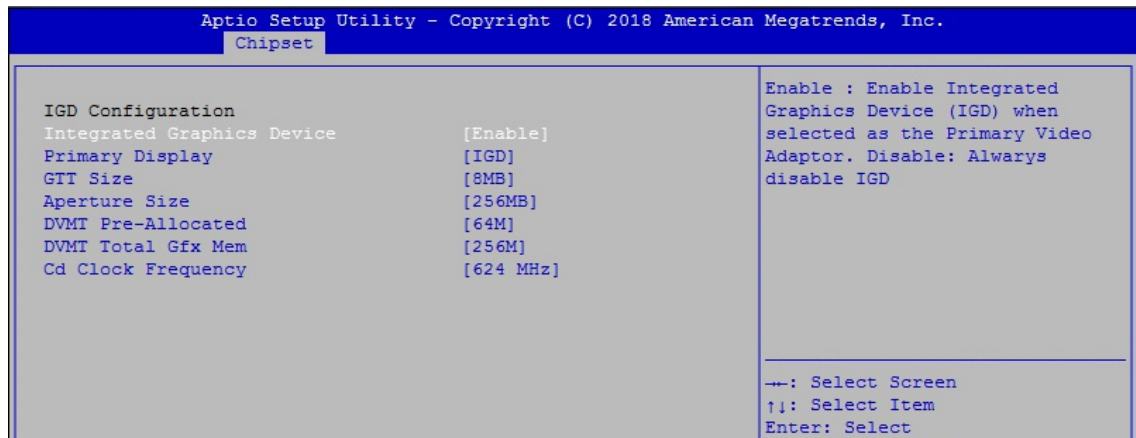


Figure 4-4-4 : Uncore Configuration

Integrated Graphics Device

Enable : Enable Integrated Graphics Device (IGD) when selected as the Primary Video Adaptor. Disable : Always disable IGD.

Primary Display

Select which of IGD/PCI Graphics device should be Primary Display

GTT Size

Select the GTT Size

Aperture Size

Select the Aperture Size

DVMT Pre-Allocated

Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device

DVMT Total Gfx Mem

Select DVMT5.0 Total Graphic Memory size used by the Internal Graphics Device

Cd Clock Frequency

Select the highest Cd Clock frequency supported by the platform

4.4.5 South Cluster configuration

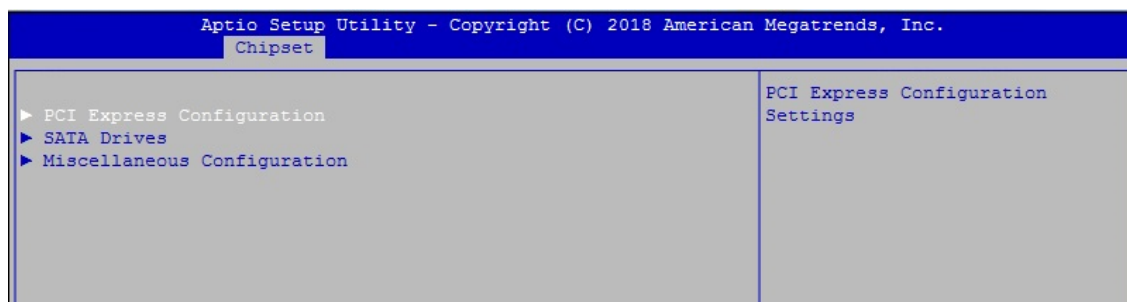


Figure 4-4-5 : South Cluster Settings

4.4.5.1 PCI Express Configuration

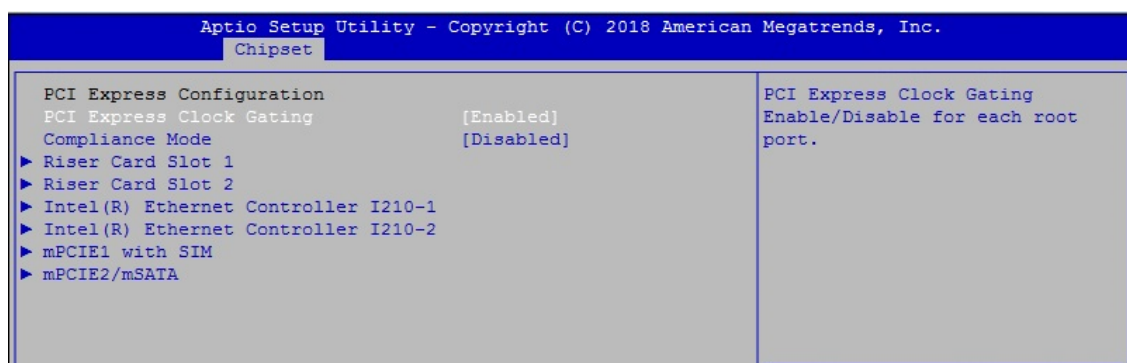


Figure 4-4-5-1 : PCI Express Settings

PCI Express Clock Gating

PCI Express Clock Gating Enable/Disable for each root port.

Compliance Mode

Compliance Mode Enable/Disable.

Riser Card Slot

Riser Card Slot settings.

Intel(R) Ethernet Controller I210

Intel(R) Ethernet Controller I210 Settings

Mini PCIe Slot with SMI

Mini PCIe Slot with SIM settings.

Mini PCIe/mSATA

Mini PCIe/mSATA Slot Settings.

4.4.5.2 SATA Drivers

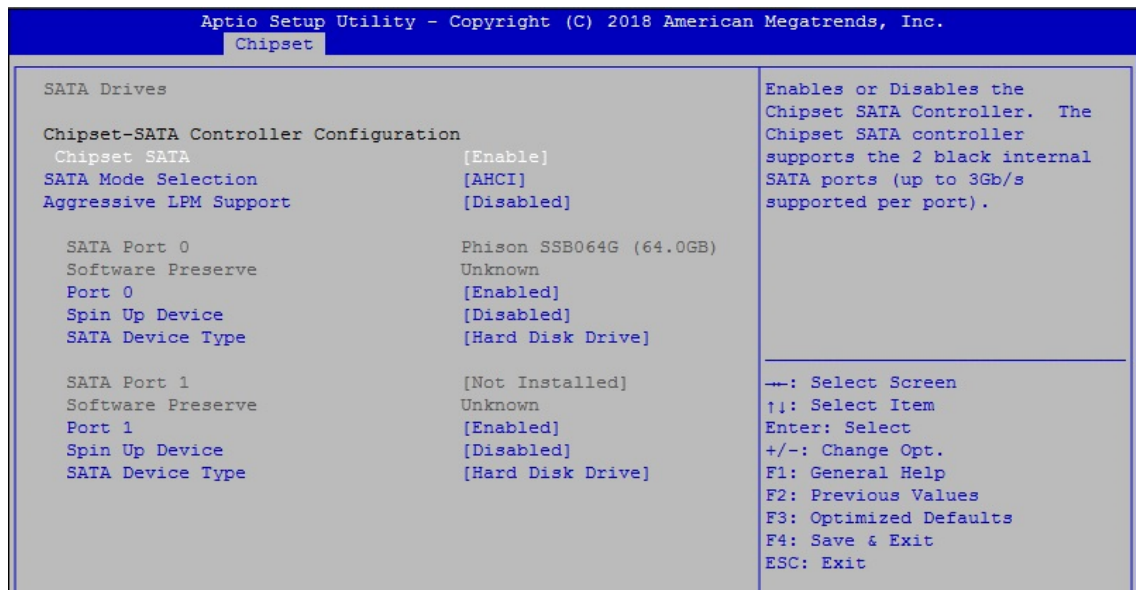


Figure 4-4-5-2 : SATA Devices Settings

Chipset SATA

Enables or Disables the Chipset SATA Controller. The Chipset SATA controller supports the 2 black internal SATA ports (up to 3Gb/s supported per port).

SATA Mode Selection

Determines how SATA controller(s) operate.

Aggressive LPM Support

Enable PCH to aggressively enter link power state.

Options for each SATA port :

Port 0/1

Enable or Disable SATA Port.

Spin up Device

If enabled for any of ports Staggered Spin Up will be performed and only the drives which have this option enabled will spin up at boot. Otherwise all drives spin up at boot.

SATA Device Type

Identify the SATA port is connected to Solid State Drive or Hard Disk Drive.

4.4.5.3 Miscellaneous Configuration

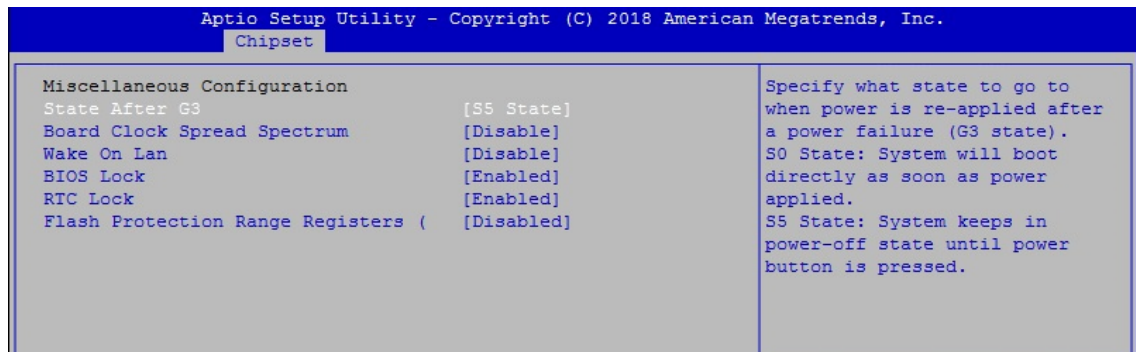


Figure 4-4-5-3 : Miscellaneous Configuration

State After G3

Specify what state to go to when power is re-applied after a power failure (G3 state). S0 State : System will boot directly as soon as power applied. S5 State : System keeps in power-off state until power button is pressed.

Board Clock Spread Spectrum

Enable Clock Chip's Spread Spectrum feature.

Wake On Lan

Enable or Disable the Wake on Lan.

BIOS Lock

Enable/Disable the SC BIOS Lock Enable feature. Required to be enabled to ensure SMM protection of flash.

RTC Lock

Enable will lock bytes 38h-3Fh in the lower/upper 128-byte bank of RTC RAM.

Flash Protection Range Registers (FPRR)

Enable Flash Protection Range Registers.

4.5 Security

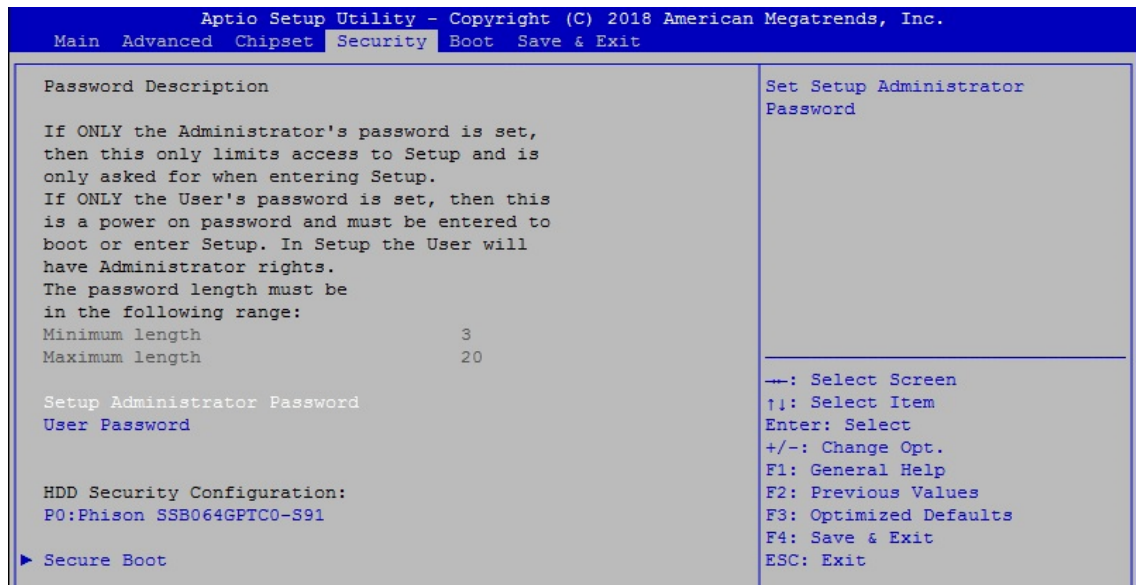


Figure 4-5 : BIOS Security Menu

Setup Administrator Password

Set Setup Administrator Password

User Password

Set User Password

Secure Boot

Customizable Secure Boot Settings.

4.5.1 HDD Security Configuration

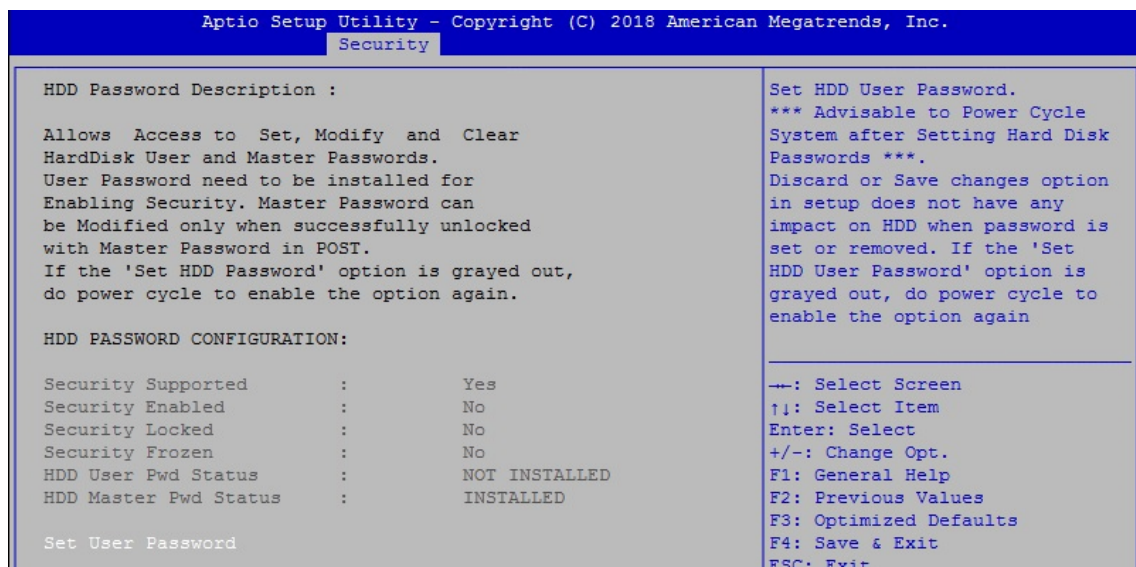


Figure 4-5-1 : HDD Security Settings

Set User Password

Set HDD user password.

Advisable to Power Cycle System after Setting Hard Disk Passwords

Discard or save changes option in setup does not have any impact on HDD when password is set or removed. If the "Set HDD User Password" option is grayed out, do power cycle to enable the option again.

4.5.2 Security Boot

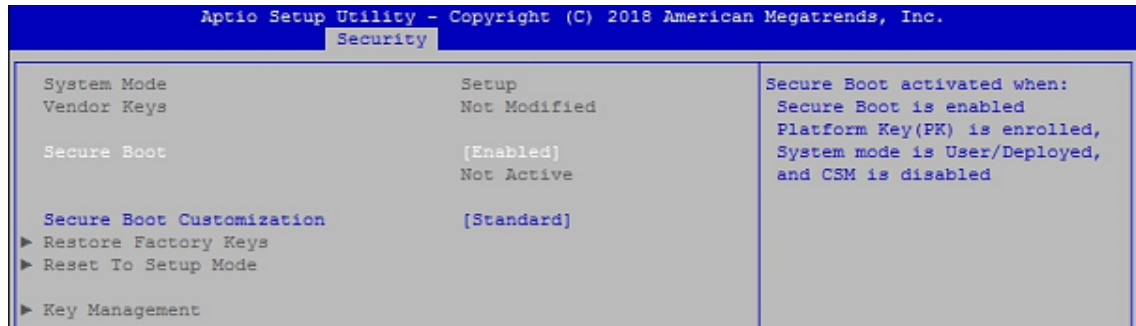


Figure 4-5-2 : Security Boot Settings

Secure Boot

Secure Boot activated when : Secure Boot is enabled Platform Key (PK) is enrolled, System mode is User/Deployed, and CSM is disabled.

Secure Boot Customization

Secure Boot mode – Custom & Standard, Set UEFI Secure Boot mode to STANDARD mode or CUSTOM mode, this change is effect after save. And after reset, the mode will return to STANDARD mode.

Key Management

Enables expert users to modify Secure Boot Policy variables without full authentication.

4.6 Boot

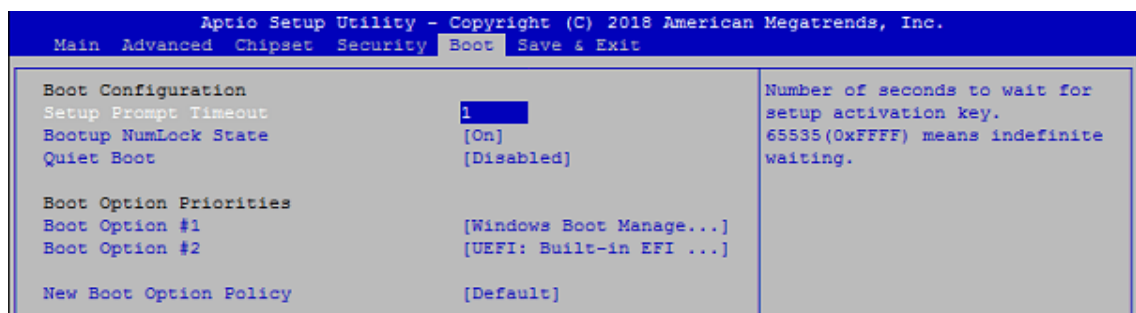


Figure 4-6 : BIOS Boot Menu

Setup Prompt Timeout

Number of seconds to wait for setup activation key. 65535 (0xFFFF) means indefinite waiting.

Bootup NumLock State

Select the keyboard NumLock state.

Quiet Boot

Enables or disables Quiet Boot option.

Boot Option #x

Sets the system boot order.

New Boot Option Policy

Controls the placement of newly detected UEFI boot options.

4.7 Save & Exit

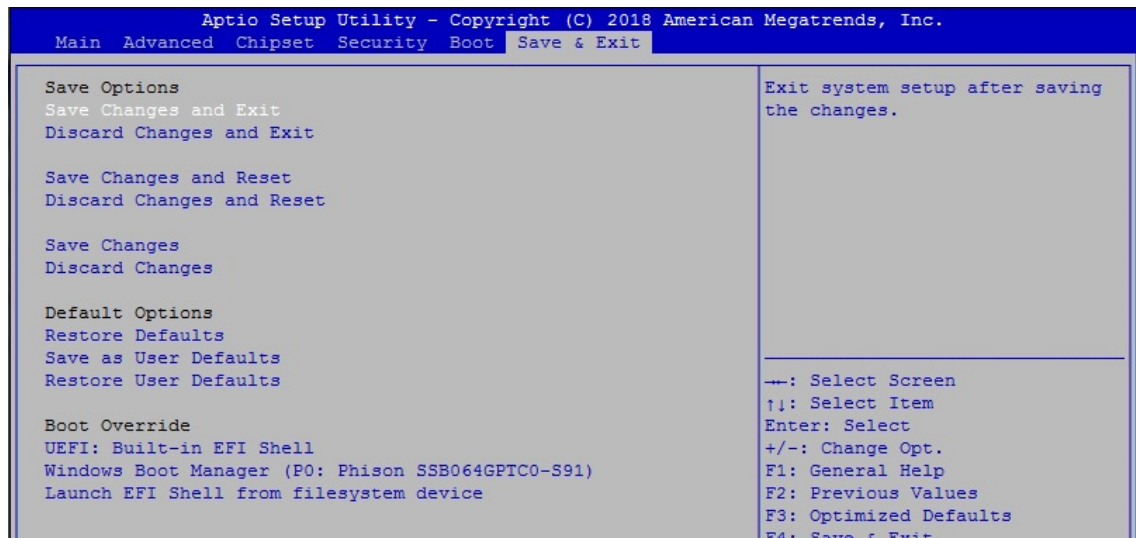


Figure 4-7 : BIOS Save and Exit Menu

Save Changes and Exit

Exit system setup after saving the changes.

Discard Changes and Exit

Exit system setup without saving any changes.

Save Changes and Reset

Reset the system after saving the changes.

Discard Changes and Reset

Reset system setup without saving any changes.

Save Changes

Save Changes done so far to any of the setup options.

Discard Changes

Discard Changes done so far to any of the setup options.

Default options :

Restore Defaults

Restore/Load Default values for all the setup options.

Save as User Defaults

Save the changes done so far as User Defaults.

Restore User Defaults

Restore the User Defaults to all the setup options.

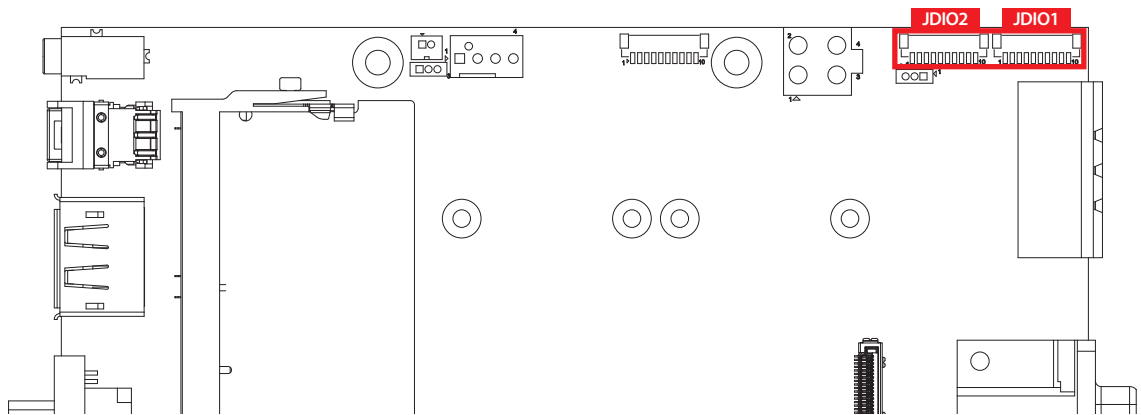
A

APPENDIX A : Isolated DIO Guide

A.1 Function Description

The SPC-4500 offers a 16-bit GPIO a pair of 10-bit internal connector, and a watchdog timer.

GPIO definition is shown below :



Pin No.	Definition	Pin No.	Definition
1	GPIO 0	1	GPIO 8
2	GPIO 1	2	GPIO 9
3	GPIO 2	3	GPIO 10
4	GPIO 3	4	GPIO 11
5	GPIO 4	5	GPIO 12
6	GPIO 5	6	GPIO 13
7	GPIO 6	7	GPIO 14
8	GPIO 7	8	GPIO 15
9	NC	9	NC
10	NC	10	NC

A.2 Software Package Contain

Distribution folder include x32 and x64 versions, use batch file for installation.

There are included as followed :

Win7_32.bat :

Installation for 32-bit driver

Win7_64.bat :

Windows update package which driver required (need to restart), and Installation for 64-bit driver

Win8_32.bat, Win8_64.bat :

Installation for driver, and guideline to Framework 3.5 distribution for sample

Win10_32.bat, and Win10_64.bat :

Installation for driver, and installation to Framework 3.5 distribution for sample

Uninstall_32.bat, and Uninstall_64.bat :

Uninstallation for driver

Run batch file as Administrator.

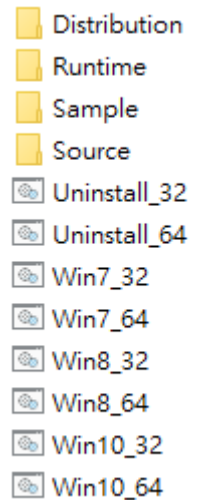
Support Windows 7 above.

Make sure Windows version before installation.

Runtime folder include head file for software developer or System Integration.

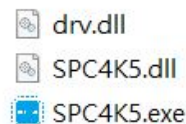
Sample folder include sample program, driver library, and API library.

Source folder include sample program source code that compile on Visual Studio 2008.

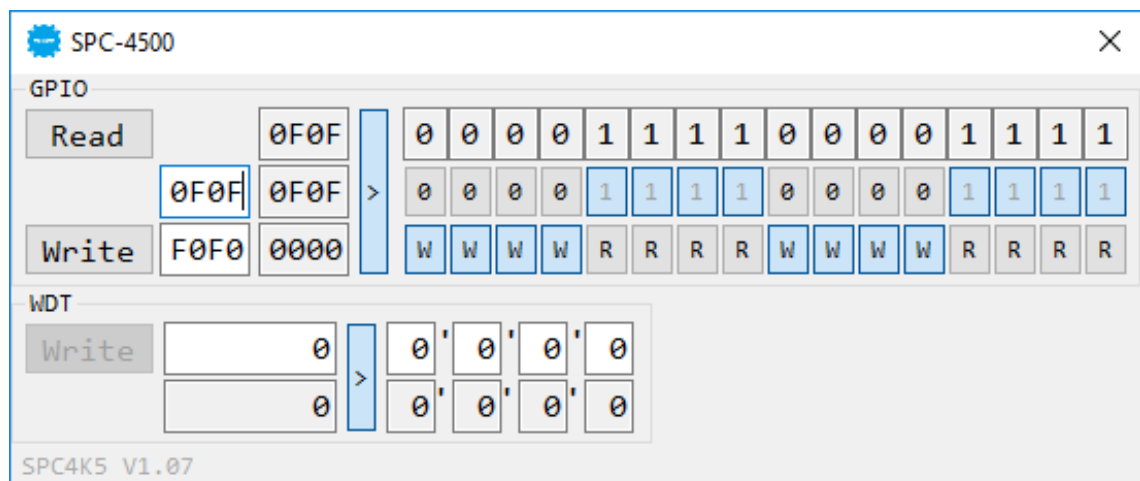


A.4 Sample

Execute DIO demo tool (SPC4K5.exe)



Sample SPC4K5.exe, as shown below :



DIO1 group :

Read button :

Set GPIO configuration to get GPIO state.

Write button :

Set GPIO configuration to set GPIO state.

GPIO output text :

User setting, GPIO output state by hexadecimal bitmask - High/Low.

Use for Write button activate.

GPIO writable text :

User setting, GPIO writable of GPIO configuration by hexadecimal bitmask - yes/no.

Use for Read/Write button activate.

GPIO input text (read only) :

GPIO input state by hexadecimal bitmask - High/Low.

Use for Read button activate.

GPIO text (read only):

GPIO output state with input state and configuration.

Use for Write button activate.

GPIO output text (read only):

GPIO output state with configuration.

Use for Write button activate.

GPIO input pin text (read only, pin 18 ~ pin 11, pin 8 ~ pin 1):

GPIO input pin state

Use for Read button activate.

GPIO output pin check button (pin 18 ~ pin 11, pin 8 ~ pin 1):

User setting, GPIO output pin state

Use for Write button activate.

GPIO pin writable check button (pin 18 ~ pin 11, pin 8 ~ pin 1):

User setting, GPIO pin writable of GPIO configuration.

Use for Read/Write button activate.

WDT group :

Write button :

Set WDT when WDT setup text is valid.

Stop button :

Cancel WDT and counting.

Use after Write button action.

WDT setup text :

User setting, WDT value, unit : second.

Use for Write button activate.

WDT counting text (read only) :

WDT counting by program timer after set WDT.

Shown after Write button action.

WDT setup day format texts (user setting) :

User setting, WDT value, format : day'hour'minute'second.

WDT counting day format text (read only) :

WDT counting, format : day'hour'minute'second.

B

APPENDIX B : Software Functions

B.1 Driver API Guide

In Runtime folder, on SPC4K5.h :

 _DLL_IMPORT_ definition is used on LoadLibrary API for SPC4K5.dll.

 SPC4K5_EXPORTS definition is used on SPC4K5.dll building.

 Otherwise, that is used to compile with SPC4K5.lib

BOOL Initial ()

Initial machine for GPIO, and watchdog timer

Return :

 TRUE (1): Success;

 FALSE (0): Fail (Driver not exists, or initial error (version is too old, or machine not match))

BOOL GetGPIOConfig (WORD *Mask)

Get GPIO configuration (by variable)

 Mask ([15:0]): In/Out, pin setting by hexadecimal bitmask

 1 : Output;

 0 : Input

Return :

 TRUE (1): Success;

 FALSE (0): Fail (Initial error, or call by pointer error, or hardware problem)

BOOL SetGPIOConfig (WORD Mask)

Set GPIO configuration

 Mask ([15:0]): In/Out, pin setting by hexadecimal bitmask

 1 : Output;

 0 : Input

Return :

 TRUE (1) : Success;

 FALSE (0) : Fail (Initial error, or hardware problem)

BOOL GetGPIO (WORD *DI)

Get GPIO input

DI ([15:0]): Input state, pin setting by hexadecimal bitmask

1 : High;

0 : Low

Return :

TRUE (1) : Success;

FALSE (0) : Fail (Initial error, or call by pointer error, or hardware problem)

BOOL SetGPIO (WORD DO)

Set GPIO output

DO ([15:0]) : output state, pin setting by hexadecimal bitmask

1 : High;

0 : Low

Return :

TRUE (1) : Success;

FALSE (0) : Fail (Initial error, or hardware problem)

BOOL GetWDT (DWORD *WDT)

Get watchdog timer setup

WDT : watchdog timer setup

Unit : second. (Range : 0 ~ 65535 sec, 1093 ~ 65535 min (=65580 ~ 3932100 sec))

Return :

TRUE (1): Success;

FALSE (0): Fail (Initial error, or call by pointer error, or hardware problem)

BOOL SetWDT (DWORD WDT)

Set watchdog timer setup

WDT : watchdog timer setup

Unit : second. (Range : 1 ~ 65535 sec, 1093 ~ 65535 min (=65580 ~ 3932100 sec))

Return :

TRUE (1) : Success;

FALSE (0) : Fail (Initial error, or setup 0 error, or hardware problem)

BOOL CancelWDT ()

Cancel watchdog timer

Return :

TRUE (1) : Success;

FALSE (0) : Fail (Initial error, or hardware problem)



APPENDIX C : Power Consumption

Testing Board	SPC-4500
RAM	DDR3L 1866 8GB x1
USB-1	USB MS Wired Keyboard 600
USB-2	USB Mouse Logitech M105
USB-3	USB Flash ADATA 3.0 16GB
USB-4	USB Flash Transecnd 3.0 16GB
SATA 0	Innodisk 3MG2-P DGS25-64GD81BC1QC 64GB
LAN 1 (i210)	1.0 Gbps
LAN 2 (i210)	1.0 Gbps
Graphics	Intel® HD Graphics 505
Graphics Output	DP
Power Plan	Balance (Windows10 Power plan)
Power Source	Chroma 62006P-100-25
Test Program	BurnInTest V8.1 Pro

C.1 Intel Apollo Lake Atom® E3950 (2M Cache, 1.60GHz)

CPU	Power Input	Power on and boot to Win10 64bit					
		Standby Mode		Sleep Mode		idle status CPU usage less 3%	
		Max Current	Max Consumption	Max Current	Max Consumption	Max Current	Max Consumption
Apollo Lake E3950	12V	0.136A	1.63W	0.145A	1.74W	0.828A	9.93W

CPU	Power Input	Power on and boot to Win10 64bit			
		Run 100% CPU usage with 2D		Run 100% CPU usage with 3D	
		Max Current	Max Consumption	Max Current	Max Consumption
Apollo Lake E3950	12V	1.054A	12.65W	1.660A	19.92W

D

APPENDIX D : Supported Memory & Storage List

D.1 Test Item

Testing Board	SPC-4500
Memory Test	Version : 5.1
BurnIn Test	V8.1

Channel	Memtest	Bunin	Flash BIOS	Remove Battery	Sleep	Hibernate	Reset	CPU-Z
*1 (Socket 1)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

D.2 NON-ECC

Brand	Info	Test Temp. (Celsius)
Vecow 4GB DDR3L-1333 SODIMM	M340L-W28M1	25°C
Kingston 2GB DDR3L-1600 SODIMM	KVR16LS11S6/2	25°C
Kingston 4GB DDR3L-1600 SODIMM	KVR16LS11/4	25°C
Crucial 4GB DDR3L-1600 SODIMM	CT51264BF160BJ.C8FER	25°C
Kingston 8GB DDR3L-1600 SODIMM	KVR16LS11/8	25°C
Kimitigo 8GB DDR3L-1600 SODIMM	KR16SD5108TZR8	25°C
innodisk 8GB DDR3L-1600 SODIMM	M3S0-8GSSDLPC-H03	25°C
ATLA 4GB DDR3L-1866 SODIMM	AD3SST4GG6WB-DMGEL	25°C
ATLA 8GB DDR3L-1866 SODIMM	AD3SST8GSAWB-DMGEL	25°C

D.3 Supported Storage Device List

Type	Vendor	Model	Capacity
mSATA	innodisk	3ME DEMSR-32GD06SW2QC	32GB
	Transcend	TS64GMSA370	64GB
	Intel	Intel-310 SSDMAEMC080G2	80GB
SATA SSD	Transcend	SSD370 TS64GSSD370	64GB
	innodisk	3MG2-P DGS25-64GD81BC1QC	64GB
	Intel	SSD 540s SSDSC2KW120H6	120GB
	Intel	SSD E 5400s SSDSC2KR120H6	120GB
	Kingston	SHFS37A	240GB
	LITE-ON	K8-L1256	256GB
	LITE-ON	K8-L1512	512GB
SATA HDD	TOSHIBA	MQ01ABF050	500GB

** If more help is needed, please contact Vecow Technical Support.



For further support information, please visit www.vecow.com

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