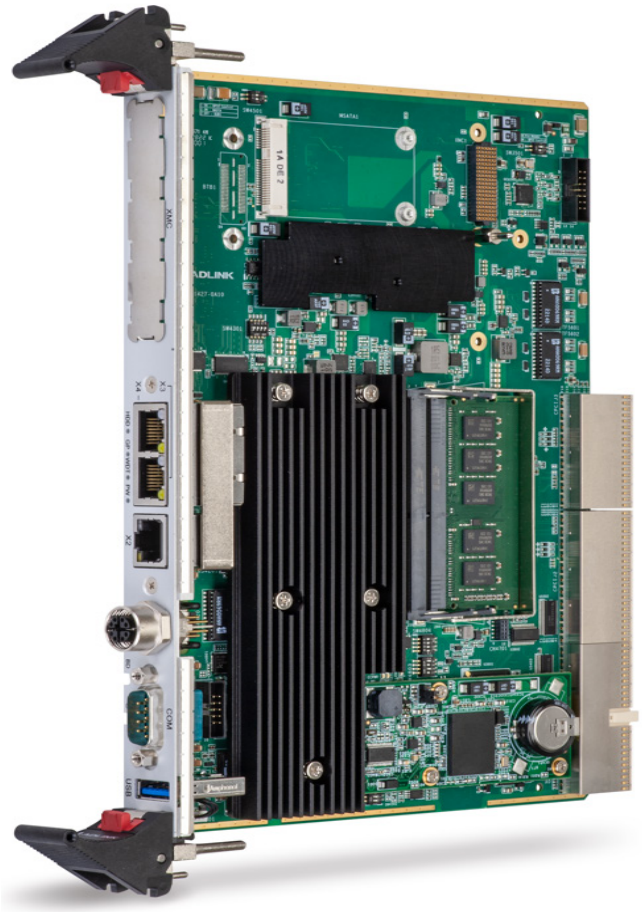
cPCI-6660 Series

User's Manual

Performance 6U CompactPCI®
Intel Atom ® x6413E Processor Blade



Manual Rev.:	Rev. 1.0
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LEADING EDGE AI COMPUTING

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Revision History

Revision	Description	Date
1.0	Initial release	2026-10-14

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Preface

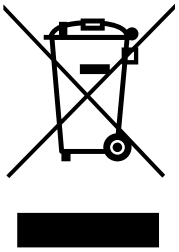
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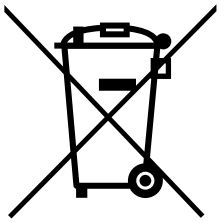
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Conventions

Take note of the following conventions used throughout this manual to make sure that users perform certain tasks and instructions properly.



NOTE: Additional information, aids, and tips that help users perform tasks.



CAUTION: Information to prevent ***minor*** physical injury, component damage, data loss, and/or program corruption when trying to complete a task.



WARNING: Information to prevent ***serious*** physical injury, component damage, data loss, and/or program corruption when trying to complete a specific task.

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1 Introduction

1.1 Overview

The ADLINK cPCI-6660 Series is a 6U CompactPCI® single-slot (4HP) processor blade built on the Intel® Elkhart Lake platform. The cPCI-6660 features a quad-core Intel® Atom® x6413E processor with a base frequency of 1.5 GHz, a burst frequency of up to 3.0 GHz, and a 9 W TDP. It is paired with dual-channel DDR4-2400/3200 MT/s memory supporting In-Band ECC (IBECC), with up to 32 GB of capacity and a DRAM retention bracket for secure memory installation.

The cPCI-6660 provides four 2.5 Gigabit Ethernet ports: three 2.5GbE RJ-45 ports on the front panel, two of which can be switched to the J3 rear I/O connector for PICMG 2.16 Packet Switching Backplane operation, plus one 2.5GbE M12 X-coded port provided through a daughterboard. Additional front-panel I/O includes one bootable USB 3.2 Gen 1x1 port and one RS-232 serial port. A PCIe x4 XMC site, which shares space with the onboard 2.5-inch SATA slot, provides mezzanine card expansion. Storage options include an optional 40/80 GB onboard industrial iSLC SSD and an onboard mSATA socket. Additional SATA, USB, serial, VGA, audio, and PS/2 signals are routed to the J3 connector for rear I/O expansion.

Security and manageability are supported by TPM 2.0, a UEFI BIOS with Secure Boot, and dual BIOS with fail-safe recovery. The cPCI-6660 operates from a single 5 V power rail, eliminating the need for a 3.3 V supply in the host rack. It functions as the master board in a PICMG 2.0 R3.0 CompactPCI backplane and can drive a chassis with up to eight slots. The cPCI-6660 also supports the PICMG 2.1 Hot Swap and PICMG 2.16 Packet Switching Backplane specifications.

Designed for extended-temperature operation from -25°C to 85°C in accordance with EN50155 OT5 Class requirements, and protected by conformal-coated PCBs on both sides, the cPCI-6660 is built to withstand the vibration, shock, and fire-safety requirements (EN45545-2 HL2) of railway and other harsh-environment industrial applications. Operating system support includes Windows 10 IoT Enterprise and VxWorks 6.9 (by request). With its high-reliability design and compact single-slot form factor, the cPCI-6660 is well suited for railway signaling, transportation control, and other rugged, long-life-cycle embedded computing applications.

1.2 Features

- 6U CompactPCI single-slot (4HP) processor blade
- Intel® Elkhart Lake platform with a quad-core Intel® Atom® x6413E processor, 1.5 GHz base, 3.0 GHz burst, and 9 W TDP
- Dual-channel DDR4-2400/3200 MT/s memory with In-Band ECC (IBECC), up to 32 GB, with a DRAM retention bracket
- Four 2.5 Gigabit Ethernet ports: 3x RJ-45 ports on the front panel (2x switchable to J3) and 1x M12 X-coded port via a daughterboard
- Supports PICMG 2.16 Packet Switching Backplane for rear GbE routing to J3
- 1x bootable USB 3.2 Gen 1x1 port on the front panel and 1x USB 2.0 port routed to J3
- 1x RS-232 port (DB-9) on the front panel, 1x RS-232 pin header, and 2x additional serial ports routed to J3
- PCIe x4 XMC expansion site (shared with the 2.5-inch SATA slot)
- Optional 40/80 GB onboard industrial iSLC SSD; onboard mSATA socket (shares signals with the 2.5-inch SATA slot); 1x SATA port routed to J3
- Supports TPM 2.0 via the Infineon SLB 9665XT2.0 for hardware-based security
- UEFI BIOS with UEFI Secure Boot; dual BIOS with fail-safe recovery
- Supports Windows 10 IoT Enterprise and VxWorks 6.9 (by request) operating systems
- 5 V-only power input; single power rail simplifies backplane power design
- Master board for a PICMG 2.0 R3.0 CompactPCI backplane, capable of supporting a chassis with up to 8 slots
- Compliant with PICMG 2.0 CompactPCI R3.0, PICMG 2.1 Hot Swap R2.0, and PICMG 2.16 Packet Switching Backplane R1.0
- VGA debug header on the front panel (14-pin flying cable); VGA, High-Definition Audio, and PS/2 signals routed to J3
- Extended operating temperature from -25°C to 85°C per EN50155 OT5 Class
- CE/FCC Class A EMC compliant; RoHS and REACH compliant
- High reliability with an MTBF of 438,634 hours (Telcordia Issue 4, 40°C, GB, GC)

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1.3 Package Contents

- cPCI-6660 blade
- Safety information



The contents of non-standard cPCI-A3535 configurations may vary depending on the customer's requirements.



This product must be protected from static discharge and physical shock. Never remove any of the components except at a static-free workstation. Use the anti-static bag shipped with the product when putting the board on a surface. Wear an anti-static wrist strap properly grounded on one of the system's ESD ground jacks when installing or servicing system components.

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2 Specifications

2.1 Product Specifications

System	Processor	Intel® Elkhart Lake platform Intel Atom® x6413E Processor, quad core, base frequency 1.5GHz, Burst frequency 3.0GHz, 9W TDP.
	Memory	Dual Channel DDR4-2400-3200MT/s with IBECC Max 32GB With retention bracket
	Ethernet	4x 2.5 Gigabit Intel® I225-IT Ethernet ports 3x 2.5G RJ-45 ports on front, 2 of them switchable to J3 • 1x 2.5G M12 X-coded Gigabit Ethernet controller i210 by daughter board
	USB	1x bootable USB 3.2 Gen 1x1 on front panel 1x USB 2.0 to J3
	Serial port	1x RS-232 port 1x RS-232 pin header 2x Serial ports to J3
	XMC PCIe	PCIe x4 XMC slot (Shared space with 2.5" SATA slot)
	VGA	One 14-pin pin header via flying cable for debugging one VGA to J3
	Audio	High-Definition Audio to J3
	PS/2	1x PS/2 to J3
	RTC	Reserve space for coin cell battery Reserve super capacitor for RTC as BOM option CompactPCI Serial R
	Storage	Optional 40/80 GB onboard iSLC Onboard mSATA slot (Share signal with 2.5" SATA drive slot) One SATA to J3
	TPM	TPM 2.0 by INFINEON SLB 9665XT2.0
	Front panel	3x RJ-45 2.5 GbE ports 1x M12 2.5 GbE port 1x USB Type A with USB 3.2 Gen 1x1 ports 1x DB-9 RS-232 port 1x Power status LED 1x WDT LED 1x HDD status LED 1x General purpose LED 1x Reset button 1x Load BIOS default button
	CompactPCI Bus	PCI 32 bit/ 33MHz
BIOS and OS	BIOS	UEFI BIOS, UEFI Secure Boot
	OS support	Windows 10 IOT Enterprise VxWorks 6.9 (By request)
Power	Power Input	5V *only*
	Power consumption	20 W with Windows OS Max mode
Mechanical	Dimension	233.33mm x 160mm x 4HP
	CompactPCI connectors	J1, J2, J3
	Thermal	Passive cooling heatsink
	PCB Coating	All PCBs conformal coated both sides – type HumiSeal 1B73 Coating (AR) Acrylic
	Net Weight	550g with heatsink, DRAM, daughter board, retention bracket
Environmental	Operating Temperature	-25°C to 85°C EN50155 OT5 Class Note: 1) The airflow inside all racks is 2m/s minimum and the operating temperature is measured near the fans in the rack. 2) According EN50155 version 2017 OT5.

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	Storage Temperature	-40°C to 85°C
	Humidity operating	5% to 95% relative humidity (non-condensing)
	Humidity storage	5% to 95% relative humidity (non-condensing)
	MTBF	438, 634 hrs. in Telcordia Issue 4 40°C GB GC
	EMC (when installed in CE/FCC Class A suitable rack)	CE/FCC Class A
	Environmental-Vibration and shocks (when installed in suitable rack)	CEI-61373 standard (1B category)
Safety	Fire Protection	Compliant to EN45545-2:2013+A1:2015 (HL 2) EL9 for PCB (R24 / R25)
Standard	PICMG Compliance	PICMG 2.0 CompactPCI R3.0 PICMG 2.1 Hot Swap R2.0 PICMG 2.16 Packet Switch Backplane R1.0
	Directive	RoHS and REACH

2.2 Block Diagram

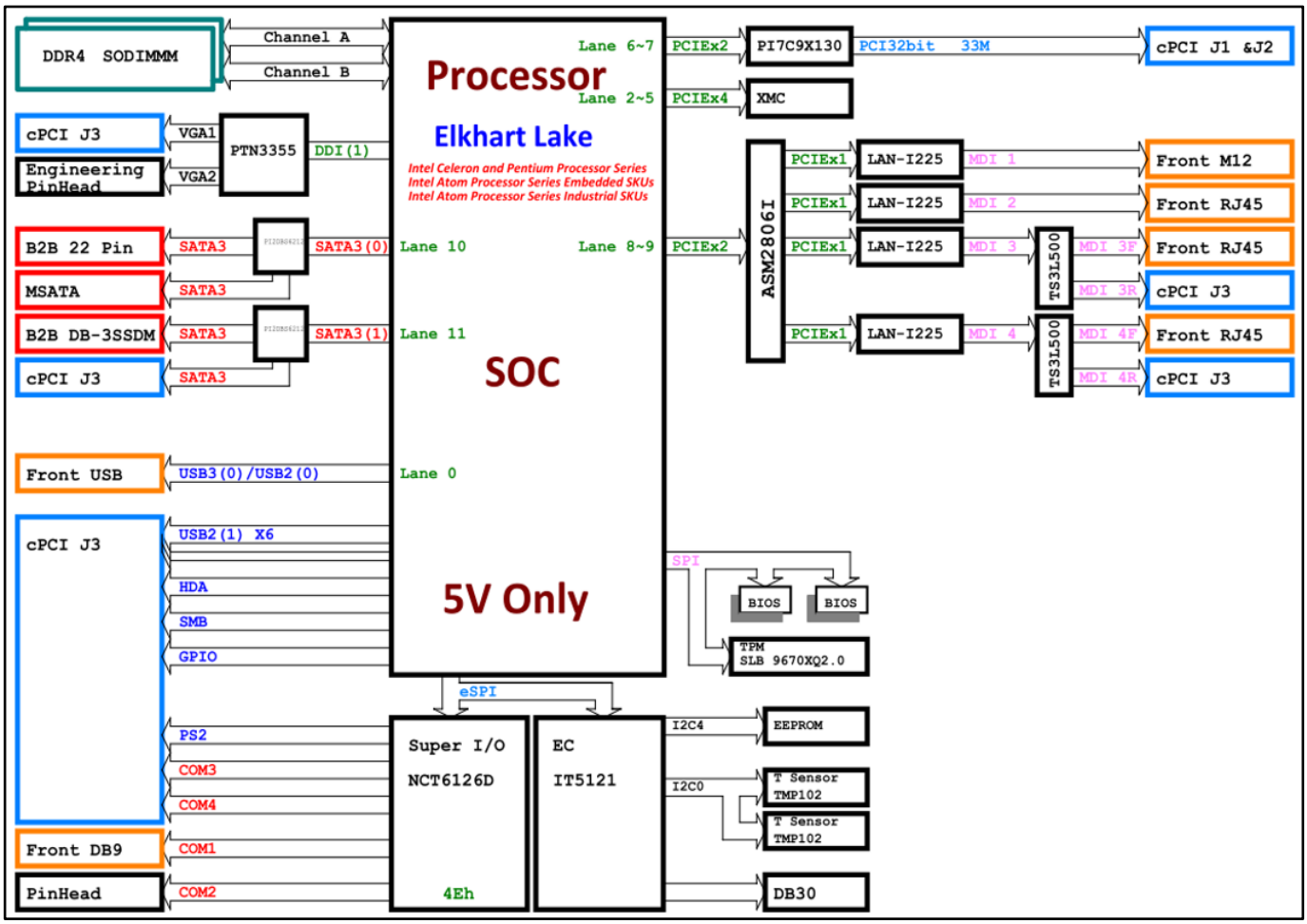


Figure 1: Functional block diagram

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2.3 I/O Connectivity Table

cPCI-6660 (8HP) I/O Connectivity Table

Function	Faceplate	Onboard
GbE (RJ45)	3	*N/A*
GbE (M12 2x1)	1	*N/A*
COM (DB9)	1	1
USB	1	*N/A*
VGA	*N/A*	1
mSATA	*N/A*	1
LED	3	*N/A*
Reset Button	1	*N/A*
BIOS Load Default Button	1	*N/A*



N/A stands for 'Not Applicable', indicating the interface is not available at that specific location.

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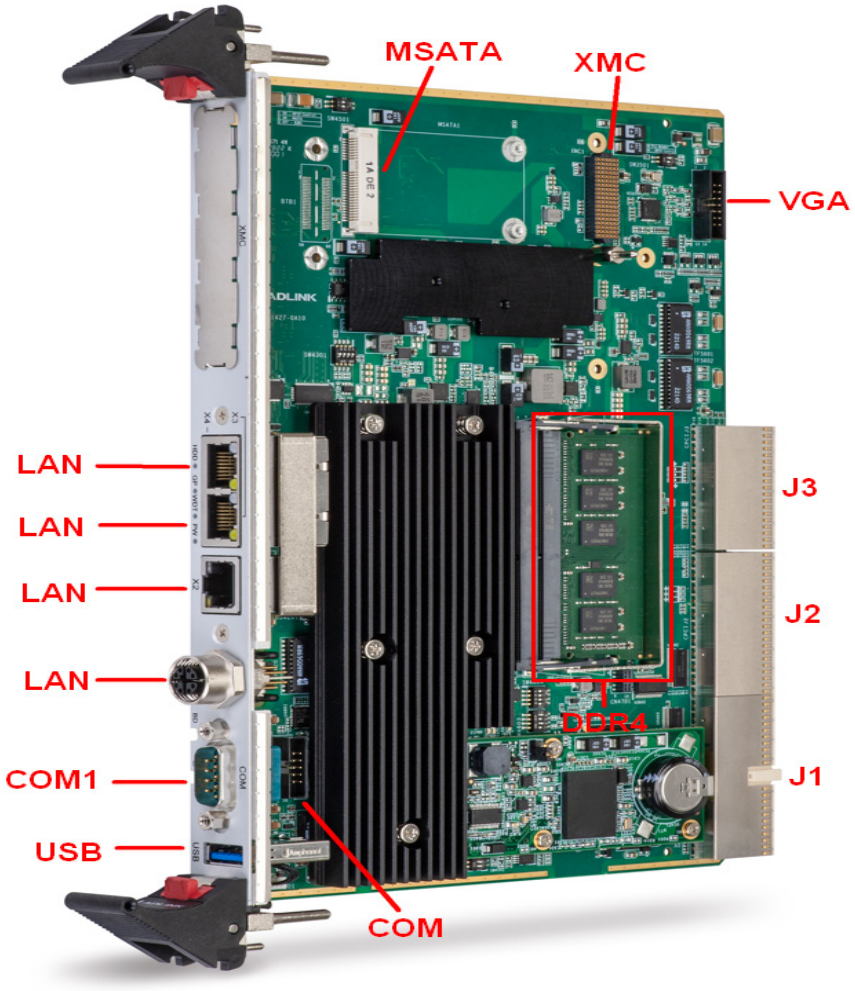
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3 Board Interfaces

This chapter illustrates the board layout, connector pin assignments, and jumper settings to familiarize users with the cPCI-6660 Series.

3.1 Board Layout

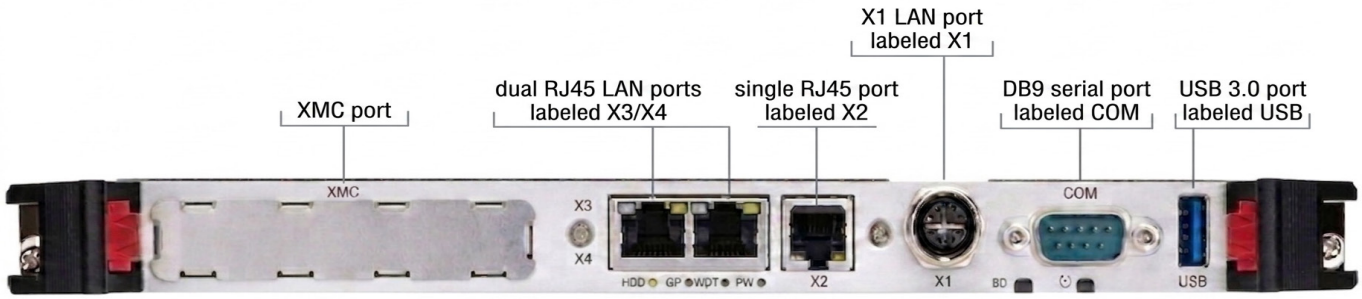


CPU	Intel® Atom™ Processor
LAN	3x Ethernet RJ-45 connector (X2~X4)
LAN	1x M12 2.5 GbE port (X1)
COM1	DB-9 RS-232 port
COM	DB-9 RS-232 port
USB	USB 3.2 Gen 1 port
VGA	One 14-pin header via flying cable
XMC	PCIe x4 XMC slot
MSATA	Onboard mSATA slot
J1	CompactPCI connector J1
J2	CompactPCI connector J2
J3	CompactPCI connector J3

Figure 2: Series board layout

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3.2 Front Panel



Hardware Front Panel Interface Inventory & Mapping Table						
System Hardware Documentation | Front Panel I/O Specifications						
Item	**Label on Panel**	**Interface Description**	**Connector Type**	**Port Designation**	**Quantity**	**Notes / Function**
1	XMC	XMC port	XMC Expansion Slot Cover / Cutout	XMC	1	Mezzanine card expansion slot
2	X3 / X4	dual RJ45 LAN ports	Dual RJ45 Ethernet Connector	X3, X4	2	Gigabit Ethernet LAN ports
3	X2	single RJ45 port	Single RJ45 Ethernet Connector	X2	1	Ethernet LAN port
4	X1	X1 LAN port	Circular Industrial Connector (M12 / Circular)	X1	1	Circular LAN / Ethernet connector
5	COM	DB9 serial port	DB9 Male / D-Sub 9-pin	COM	1	RS-232 Serial Communications
6	USB	USB 3.0 port	USB 3.2 Gen 1 Type-A	USB	1	High-speed USB 3.0 Host port

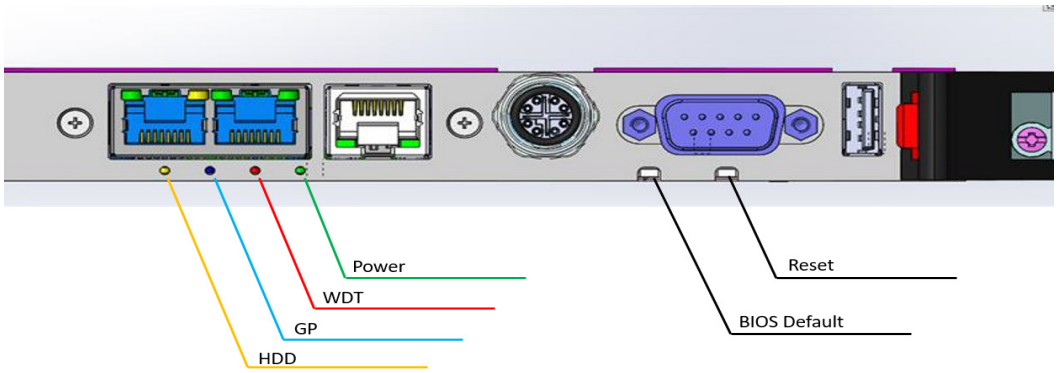
Figure 3: Front Panel

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4 Connector Pinouts and Jumper Settings

4.1 System LEDs

LED	LED Color	Status
Power LED	Green	System Power OK
WDT LED	Red	Watchdog (Control by EC)
GP LED	Blue	User Defined (Control by PCH)
HDD LED	Yellow	SATA Read/Write (Control by PCH)



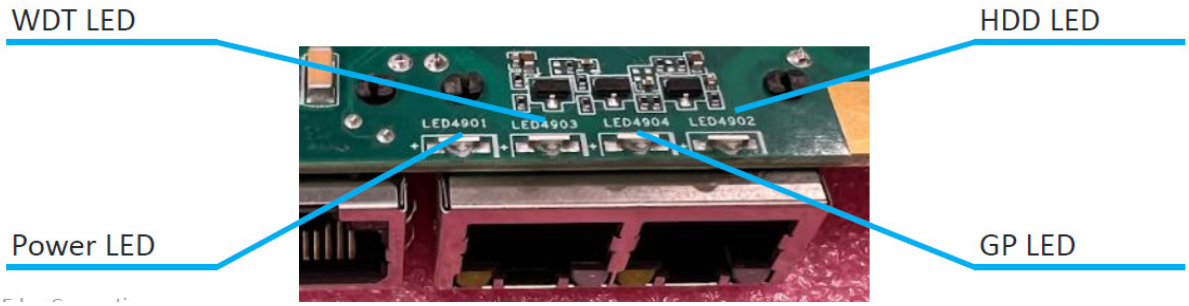
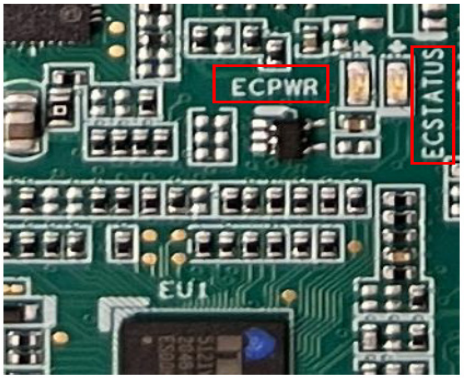
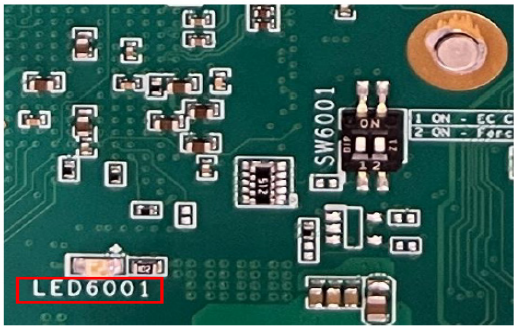


Figure 4: Front panel system LED descriptions

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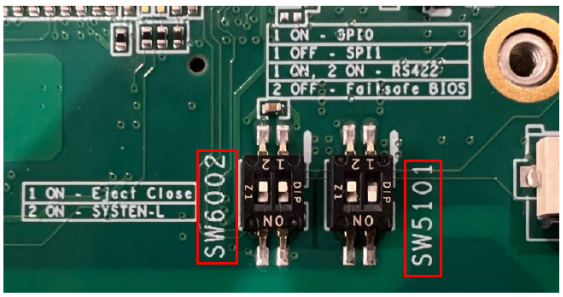
LED	LED Color	Status
ECPWR	Green	Sleep S3 Power OK
ECSTATUS	Blue	EC Status
LED6001	Blue	Main 5V OK

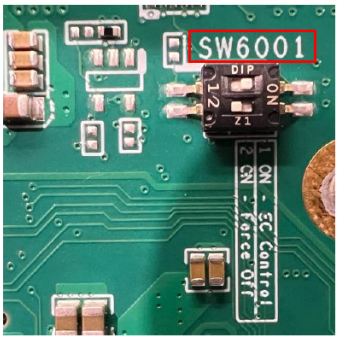




4.2 Switch and Jumper Settings

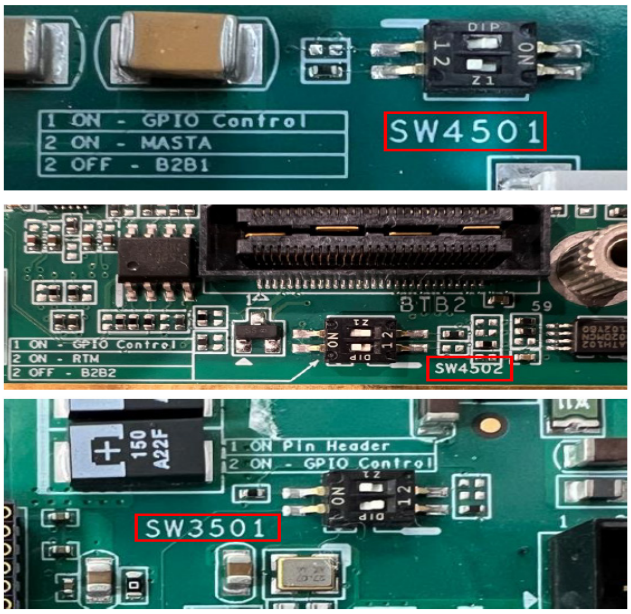
Switch	Mode	Status
SW5101	1, On	Boot SPI0 (Default)
	1, Off	Boot SPI1
	2, On	Normal BIOS
	2, Off	Failsafe BIOS (Default)
SW6001	1, On; 2, Off	Main Power Control by EC (Default)
	1, Off; 2, Off	Force Power On
	1, Off; 2, On	Force Power Off
SW6002	1, On	Eject Close
	1, Off	Eject Control by Handle (Default)
	2, On	Set As System Slot
	2, Off	Set by Backplane (Default)





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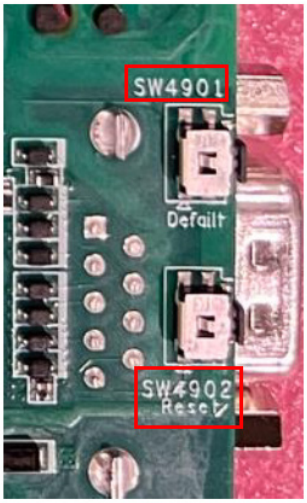
Switch	Mode	Status
SW4501	1, On; 2, Off	GPIO Control (Default)
	1, Off; 2, Off	SATA0 to B2B1
	1, Off; 2, On	SATA0 to MSATA
SW4502	1, On; 2, Off	GPIO Control (Default)
	1, Off; 2, Off	SATA1 to B2B2
	1, Off; 2, On	SATA1 to RTM
SW3501	1, Off; 2, On	GPIO Control (Default)
	1, Off; 2, Off	VGA to RTM
	1, On; 2, Off	VGA to Pin Header



Switch	Mode	Status
SW4301	1,3On ; 2,4Off	GPIO Control (Default)
	1,3Off ; 2,4Off	Ethernet to Front
	1,3Off ; 2,4On	Ethernet to RTM



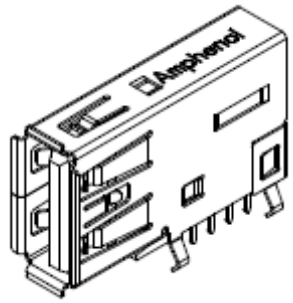
Switch	Mode	Status
SW4901	Push	BIOS load Default
SW4902	Push	Reset



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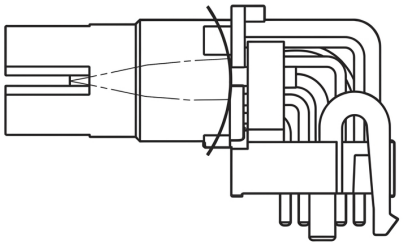
4.1 Connector Pin Assignments

4.1.1 USB 3.0 (USB1)



Pin	Signal
1	P5V_USB1
2	USB2_FP1L_DN1
3	USB2_FP1L_DP1
4	GND
5	USB3_CNL_RX1_N
6	USB3_CNL_RX1_P
7	GND
8	USB3_CNL_TX1_N
9	USB3_CNL_TX1_P
11	CHGND_LAN
12	CHGND_LAN
13	CHGND_LAN
14	CHGND_LAN

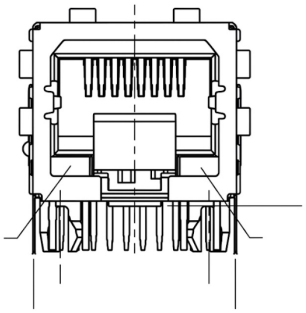
4.1.2 LAN (X1)



Pin	Signal Name
1	GBE1_M12_MDI0_P
2	GBE1_M12_MDI0_N
3	GBE1_M12_MDI1_P
4	GBE1_M12_MDI1_N
5	GBE1_M12_MDI3_P
6	GBE1_M12_MDI3_N
7	GBE1_M12_MDI2_N
8	GBE1_M12_MDI2_P
G1	NC

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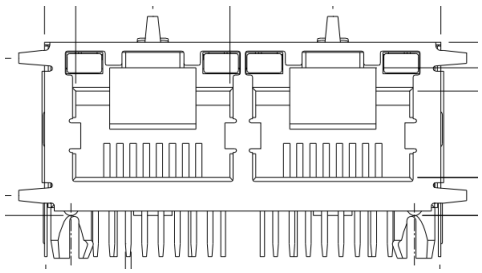
4.1.3 LAN (X2)



Pin	Signal Name
R1	NC
R2	LAN2_MDI0_P
R3	LAN2_MDI0_N
R4	LAN2_MDI1_P
R5	LAN2_MDI1_N
R6	LAN2_MDI2_P
R7	LAN2_MDI2_N
R8	LAN2_MDI3_P
R9	LAN2_MDI3_N
R10	GND
L1	LAN1_LED_Y_P
L2	LAN2_LED2-L
L3	LAN2_LED1-L
L4	LAN2_LED0-L

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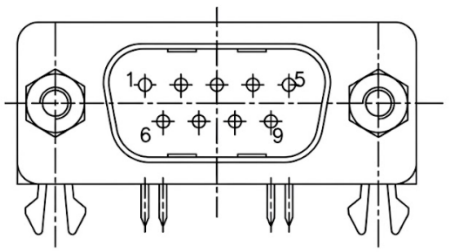
4.1.4 LAN (X3 X4)



Pin	Signal Name	Pin	Signal Name
AR1	LAN4_FP_MDI0_P	BR1	LAN3_FP_MDI0_P
AR2	LAN4_FP_MDI0_N	BR2	LAN3_FP_MDI0_N
AR3	LAN4_FP_MDI1_P	BR3	LAN3_FP_MDI1_P
AR4	LAN4_FP_MDI1_N	BR4	LAN3_FP_MDI1_N
AR5	Cap to GND	BR5	Cap to GND
AR6	GND	BR6	GND
AR7	LAN4_FP_MDI2_P	BR7	LAN3_FP_MDI2_P
AR8	LAN4_FP_MDI2_N	BR8	LAN3_FP_MDI2_N
AR9	LAN4_FP_MDI3_P	BR9	LAN3_FP_MDI3_P
AR10	LAN4_FP_MDI3_N	BR10	LAN3_FP_MDI3_N
AL1	LAN4_FP_LED2-L	BL1	LAN3_FP_LED2-L
AL2	LAN4_LED_Y_P	BL2	LAN3_LED_Y_P
AL3	LAN4_FP_LED0-L	BL3	LAN3_FP_LED0-L
AL4	LAN4_FP_LED1-L	BL4	LAN3_FP_LED1-L

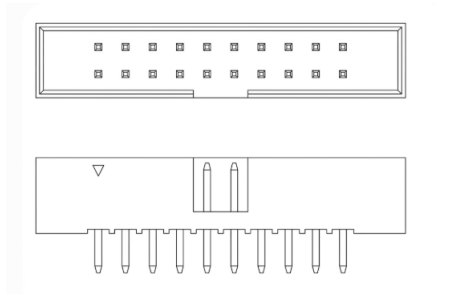
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4.1.5 COM (COM1)



Pin	Signal
1	COM1_DCD-L_CN
2	COM1_RXD_CN
3	COM1_TXD_CN
4	COM1_DTR-L_CN
5	GND
6	COM1_DSR-L_CN
7	COM1_RTS-L_CN
8	COM1_CTS-L_CN
9	COM1_RI-L_CN

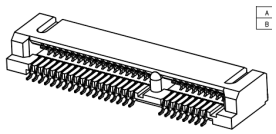
4.1.6 COM (pin header)



Pin	Signal
1	COM2_DCD-L_CN
2	COM2_DSR-L_CN
3	COM2_RXD_CN
4	COM2_RTS-L_CN
5	COM2_TXD_CN
6	COM2_CTS-L_CN
7	COM2_DTR-L_CN
8	COM2_RI-L_CN
9	GND
10	NC

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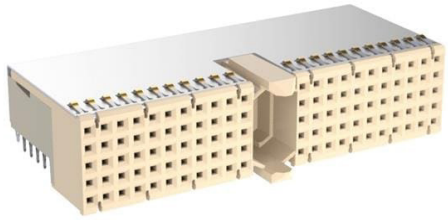
4.1.7 MSATA (MSATA1)



Pin	Signal	Pin	Signal
1	NC	2	P_+3V3_A
3	NC	4	GND
5	NC	6	P_+1V5_A
7	NC	8	NC
9	GND	10	NC
11	NC	12	NC
13	NC	14	NC
15	GND	16	NC
17	NC	18	GND
19	NC	20	NC
21	GND	22	NC
23	SATA_MSATA_RX_C_P	24	P_+3V3_A
25	SATA_MSATA_RX_C_N	26	GND
27	GND	28	P_+1V5_A
29	GND	30	MSATA_SCL
31	SATA_MSATA_TX_C_N	32	MSATA_SDA
33	SATA_MSATA_TX_C_P	34	GND
35	GND	36	NC
37	GND	38	NC
39	P_+3V3_A	40	GND
41	P_+3V3_A	42	NC
43	NC	44	NC
45	NC	46	NC
47	NC	48	P_+1V5_A
49	NC	50	GND
51	MSATA_PRSNT	52	P_+3V3_A
53	GND	54	GND

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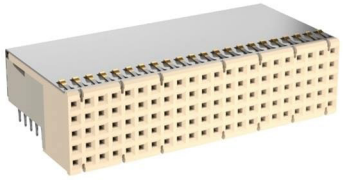
4.1.8 cPCI J1 (cPCIJ1)



A1	P_+5V_PSU	A7	CPCI_PCI_AD30	A15	NC	A21	NC
B1	NC	B7	CPCI_PCI_AD29	B15	CPCI_FRAME-L	B21	CPCI_PCI_AD9
C1	CPCI_TRST-L	C7	CPCI_PCI_AD28	C15	CPCI_IRDY-L	C21	CPCI_PCI_AD8
D1	NC	D7	GND	D15	CPCI_BDSEL-L	D21	CPCI_M66EN
E1	P_+5V_PSU	E7	CPCI_PCI_AD27	E15	CPCI_TRDY-L	E21	CPCI_CBE0-L
A2	CPCI_TCK	A8	CPCI_PCI_AD26	A16	CPCI_DEVSEL-L	A22	CPCI_PCI_AD7
B2	P_+5V_PSU	B8	GND	B16	GND	B22	GND
C2	CPCI_TMS	C8	cPCI_VIO_BP	C16	cPCI_VIO_BP	C22	NC
D2	NC	D8	CPCI_PCI_AD25	D16	CPCI_STOP-L	D22	CPCI_PCI_AD6
E2	CPCI_TDI	E8	CPCI_PCI_AD24	E16	CPCI_LOCK-L	E22	CPCI_PCI_AD5
A3	CPCI_INTA-L	A9	CPCI_CBE3-L	A17	NC	A23	NC
B3	CPCI_INTB-L	B9	CPCI_IDSEL	B17	IPMB_CLK	B23	CPCI_PCI_AD4
C3	CPCI_INTC-L	C9	CPCI_PCI_AD23	C17	IPMB_DAT	C23	CPCI_PCI_AD3
D3	P_+5V_PSU	D9	GND	D17	GND	D23	P_+5V_PSU
E3	CPCI_INTD-L	E9	CPCI_PCI_AD22	E17	CPCI_PERR-L	E23	CPCI_PCI_AD2
A4	P_+5V_IPMB	A10	CPCI_PCI_AD21	A18	CPCI_SERR-L	A24	CPCI_PCI_AD1
B4	CPCI_HEALTHY-L	B10	GND	B18	GND	B24	P_+5V_PSU
C4	cPCI_VIO_BP	C10	NC	C18	NC	C24	cPCI_VIO_BP
D4	CPCI_INTP	D10	CPCI_PCI_AD20	D18	CPCI_PAR	D24	CPCI_PCI_AD0
E4	CPCI_INTS	E10	CPCI_PCI_AD19	E18	CPCI_CBE1-L	E24	CPCI_ACK64_R-L
A5	NC	A11	CPCI_PCI_AD18	A19	NC	A25	P_+5V_PSU
B5	NC	B11	CPCI_PCI_AD17	B19	CPCI_PCI_AD15	B25	CPCI_REQ64_R-L
C5	CPCI_PCIRST#	C11	CPCI_PCI_AD16	C19	CPCI_PCI_AD14	C25	CPCI_ENUM-L
D5	GND	D11	GND	D19	GND	D25	NC
E5	CPCI_GNT0-L	E11	CPCI_CBE2-L	E19	CPCI_PCI_AD13	E25	P_+5V_PSU
A6	CPCI_REQ0-L			A20	CPCI_PCI_AD12		
B6	CPCI_PRESENT-L			B20	GND		
C6	NC			C20	cPCI_VIO_BP		
D6	CPCI_CLK0			D20	CPCI_PCI_AD11		
E6	CPCI_PCI_AD31			E20	CPCI_PCI_AD10		

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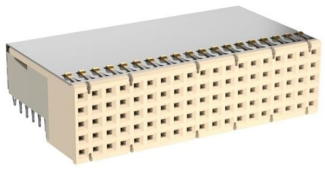
4.1.9 cPCI J2 (cPCIJ2)



A1	BDG_CLK1	A7	CPCI_PCI_AD59	A12	CPCI_PCI_AD42	A18	NC
B1	GND	B7	GND	B12	CPCI_PCI_AD41	B18	NC
C1	CPCI_REQ1-L	C7	cPCI_VIO_BP	C12	CPCI_PCI_AD40	C18	NC
D1	CPCI_GNT1-L	D7	CPCI_PCI_AD58	D12	GND	D18	GND
E1	CPCI_REQ2-L	E7	CPCI_PCI_AD57	E12	CPCI_PCI_AD39	E18	NC
F1	GND	F7	GND	F12	GND	F18	GND
A2	BDG_CLK2	A8	CPCI_PCI_AD56	A13	CPCI_PCI_AD38	A19	GND
B2	BDG_CLK3	B8	CPCI_PCI_AD55	B13	GND	B19	GND
C2	CPCI_SYSEN-L	C8	CPCI_PCI_AD54	C13	cPCI_VIO_BP	C19	NC
D2	CPCI_GNT2-L	D8	GND	D13	CPCI_PCI_AD37	D19	NC
E2	CPCI_REQ3-L	E8	CPCI_PCI_AD53	E13	CPCI_PCI_AD36	E19	NC
F2	GND	F8	GND	F13	GND	F19	GND
A3	BDG_CLK4	A9	CPCI_PCI_AD52	A14	CPCI_PCI_AD35	A20	BDG_CLK5
B3	GND	B9	GND	B14	CPCI_PCI_AD34	B20	GND
C3	CPCI_GNT3-L	C9	cPCI_VIO_BP	C14	CPCI_PCI_AD33	C20	NC
D3	CPCI_REQ4-L	D9	CPCI_PCI_AD51	D14	GND	D20	GND
E3	CPCI_GNT4-L	E9	CPCI_PCI_AD50	E14	CPCI_PCI_AD32	E20	NC
F3	GND	F9	GND	F14	GND	F20	GND
A4	cPCI_VIO_BP	A10	CPCI_PCI_AD49	A15	NC	A21	BDG_CLK6
B4	NC	B10	CPCI_PCI_AD48	B15	GND	B21	GND
C4	CPCI_CBE7-L	C10	CPCI_PCI_AD47	C15	CPCI_FALR-L	C21	NC
D4	GND	D10	GND	D15	CPCI_REQ5-L	D21	NC
E4	CPCI_CBE6-L	E10	CPCI_PCI_AD46	E15	CPCI_GNT5-L	E21	NC
F4	GND	F10	GND	F15	GND	F21	GND
A5	CPCI_CBE5-L	A11	CPCI_PCI_AD45	A16	NC	A22	CPCI_GA4
B5	CPCI_DEV64-L	B11	GND	B16	NC	B22	CPCI_GA3
C5	cPCI_VIO_BP	C11	cPCI_VIO_BP	C16	CPCI_DEGR-L	C22	CPCI_GA2
D5	CPCI_CBE4-L	D11	CPCI_PCI_AD44	D16	GND	D22	CPCI_GA1
E5	CPCI_PAR64	E11	CPCI_PCI_AD43	E16	NC	E22	CPCI_GA0
F5	GND	F11	GND	F16	GND	F22	GND
A6	CPCI_PCI_AD63			A17	NC		
B6	CPCI_PCI_AD62			B17	GND		
C6	CPCI_PCI_AD61			C17	CPCI_RSTBTN-L		
D6	GND			D17	CPCI_REQ6-L		
E6	CPCI_PCI_AD60			E17	CPCI_GNT6-L		
F6	GND			F17	GND		

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4.1.10 cPCI J3 (cPCIJ3)

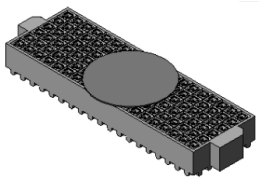


A1	A_RST-L	A7	SIO_COM4_SOUT	A12	USB2_RTM3_DP3	A18	GBE3_RTM_MDI0_P
B1	A_SYNC	B7	SIO_COM4_SIN	B12	USB2_RTM3_DN3	B18	GBE3_RTM_MDI0_N
C1	A_CLK	C7	SIO_COM3_DCD-L	C12	GND	C18	GND
D1	A_SDO	D7	SMB_J3_R_SCL	D12	USB2_RTM4_DP4	D18	GBE3_RTM_MDI2_P
E1	A_SDI0_R	E7	SMB_J3_R_SDA	E12	USB2_RTM4_DN4	E18	GBE3_RTM_MDI2_N
F1	GND	F7	GND	F12	GND	F18	GND
A2	A_SDI1_R	A8	SIO_COM3_SIN	A13	USB2_RTM5_DP5	A19	P_+5V_PSU
B2	NC	B8	SIO_COM3_SOUT	B13	USB2_RTM5_DN5	B19	P_+5V_PSU
C2	NC	C8	SIO_COM3_DTR-L	C13	GND	C19	P_+12V_A
D2	NC	D8	SIO_COM3_DSR-L	D13	USB2_RTM6_DP6	D19	P_+5V_PSU
E2	NC	E8	SIO_COM3_RTS-L	E13	USB2_RTM6_DN6	E19	P_+5V_PSU
F2	GND	F8	GND	F13	GND	F19	GND
A3	SIO_KB_DATA	A9	SIO_COM3_CTS-L	A14	USB_RTM2_OC-L		
B3	SIO_KB_CLK	B9	SIO_COM3_RI-L	B14	USB_RTM3_OC-L		
C3	RTM_GPIO1	C9	VGA_RTM_B	C14	USB_RTM4_OC-L		
D3	SIO_MS_DATA	D9	VGA_RTM_R	D14	USB_RTM5_OC-L		
E3	SIO_MS_CLK	E9	VGA_RTM_G	E14	USB_RTM6_OC-L		
F3	GND	F9	GND	F14	GND		
A4	SATA_RTM_TXD_C_P	A10	USB_RTM1_OC-L	A15	GBE4_RTM_MDI1_P		
B4	SATA_RTM_TXD_C_N	B10	VGA_RTM_DDC_SCL	B15	GBE4_RTM_MDI1_N		
C4	GND	C10	VGA_RTM_DDC_SDA	C15	GND		
D4	NC	D10	VGA_RTM_H	D15	GBE4_RTM_MDI3_P		
E4	NC	E10	VGA_RTM_V	E15	GBE4_RTM_MDI3_N		
F4	GND	F10	GND	F15	GND		
A5	GND	A11	USB2_RTM1_DP1	A16	GBE4_RTM_MDI0_P		
B5	GND	B11	USB2_RTM1_DN1	B16	GBE4_RTM_MDI0_N		
C5	RTM_GPIO2	C11	GND	C16	GND		
D5	GND	D11	USB2_RTM2_DP2	D16	GBE4_RTM_MDI2_P		
E5	GND	E11	USB2_RTM2_DN2	E16	GBE4_RTM_MDI2_N		
F5	GND	F11	GND	F16	GND		
A6	SATA_RTM_RXD_C_P			A17	GBE3_RTM_MDI1_P		
B6	SATA_RTM_RXD_C_N			B17	GBE3_RTM_MDI1_N		

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C6	GND			C17	GND		
D6	NC			D17	GBE3_RTM_MDI3_P		
E6	NC			E17	GBE3_RTM_MDI3_N		
F6	GND			F17	GND		

4.1.11 XMC (XMC1)

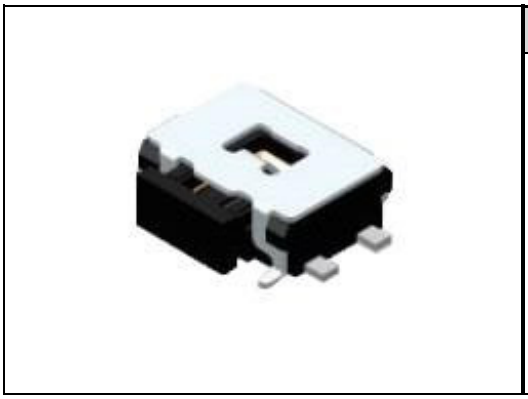


A1	PCIE_LAN2_RX0_P	A7	NC	A11	PCIE_LAN2_TX0_C_P	A17	NC
B1	PCIE_LAN2_RX0_N	B7	NC	B11	PCIE_LAN2_TX0_C_N	B17	NC
C1	P_+3V3_A	C7	P_+3V3_A	C11	NC	C17	NC
D1	PCIE_LAN3_RX1_P	D7	NC	D11	PCIE_LAN3_TX1_C_P	D17	NC
E1	PCIE_LAN3_RX1_N	E7	NC	E11	PCIE_LAN3_TX1_C_N	E17	NC
F1	XMC1_VPWR	F7	XMC1_VPWR	F11	XMC1_VPWR	F17	NC
A2	GND	A8	GND	A12	GND	A18	GND
B2	GND	B8	GND	B12	GND	B18	GND
C2	XMC1_TRST-L	C8	XMC1_TDI	C12	XMC1_GA1	C18	NC
D2	GND	D8	GND	D12	GND	D18	GND
E2	GND	E8	GND	E12	GND	E18	GND
F2	PCH_PLTRST-L_XMC	F8	NC	F12	XMC1_MPRESENT-L	F18	NC
A3	PCIE_LAN4_RX2_P	A9	NC	A13	PCIE_LAN4_TX2_C_P	A19	PCIE_XMC_CLK1_P
B3	PCIE_LAN4_RX2_N	B9	NC	B13	PCIE_LAN4_TX2_C_N	B19	PCIE_XMC_CLK1_N
C3	P_+3V3_A	C9	NC	C13	XMC1_P3V3AUX	C19	NC
D3	PCIE_LAN5_RX3_P	D9	NC	D13	PCIE_LAN5_TX3_C_P	D19	XMC1_WAKE-L
E3	PCIE_LAN5_RX3_N	E9	NC	E13	PCIE_LAN5_TX3_C_N	E19	XMC1_ROOT-L
F3	XMC1_VPWR	F9	XMC1_VPWR	F13	XMC1_VPWR	F19	NC
A4	GND	A10	GND	A14	GND		
B4	GND	B10	GND	B14	GND		
C4	XMC1_TCK	C10	NC	C14	XMC1_GA2		
D4	GND	D10	GND	D14	GND		
E4	GND	E10	GND	E14	GND		
F4	XMC_RST-L	F10	XMC1_GA0	F14	XMC1_DAT		
A5	NC			A15	NC		
B5	NC			B15	NC		
C5	P_+3V3_A			C15	NC		
D5	NC			D15	NC		

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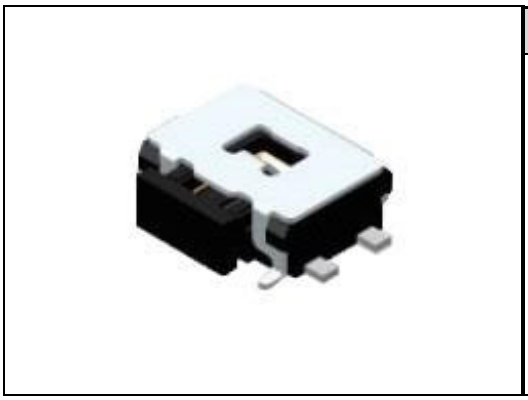
E5	NC			E15	NC		
F5	XMC1_VPWR			F15	XMC1_VPWR		
A6	GND			A16	GND		
B6	GND			B16	GND		
C6	XMC1_TMS			C16	NC		
D6	GND			D16	GND		
E6	GND			E16	GND		
F6	P_+12V_XMC			F16	XMC1_CLK		

4.1.12 Reset Button



Pin	Signal
1	FP_RSTBTN-L

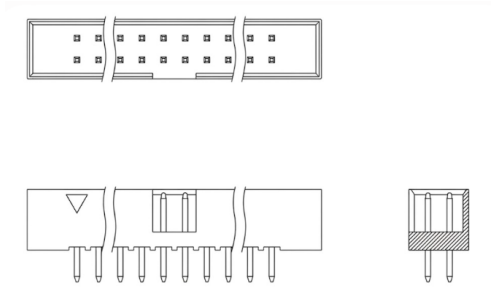
4.1.13 BIOS Load Default



Pin	Signal
1	PCH_BIOS_DEFAULT-L

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4.1.14 Engineering VGA (CN3501)



Pin	Signal
1	P_+5V_DPVGA
2	VGA_ENG_SDA
3	NC
4	VGA_ENG_SCL
5	GND
6	VGA_CN_R
7	GND
8	VGA_CN_G
9	GND
10	VGA_CN_B
11	GND
12	VGA_CN_H
13	GND
14	VGA_CN_V

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5 Getting Started

This chapter describes the following installation procedures for the cPCI-6660 module:

- MSATA drive

5.1 MSATA Drive Installation

The 1-slot cPCI-6660 versions provide space to install an MSATA storage drive.

Installing an MSATA Drive

1. Locate the mSATA slot on the mainboard.
2. Align and insert the mSATA drive into the mSATA slot at the designated angle.
3. Push the mSATA drive down flush with the mounting standoffs, then secure it in place using two screws with a screwdriver.

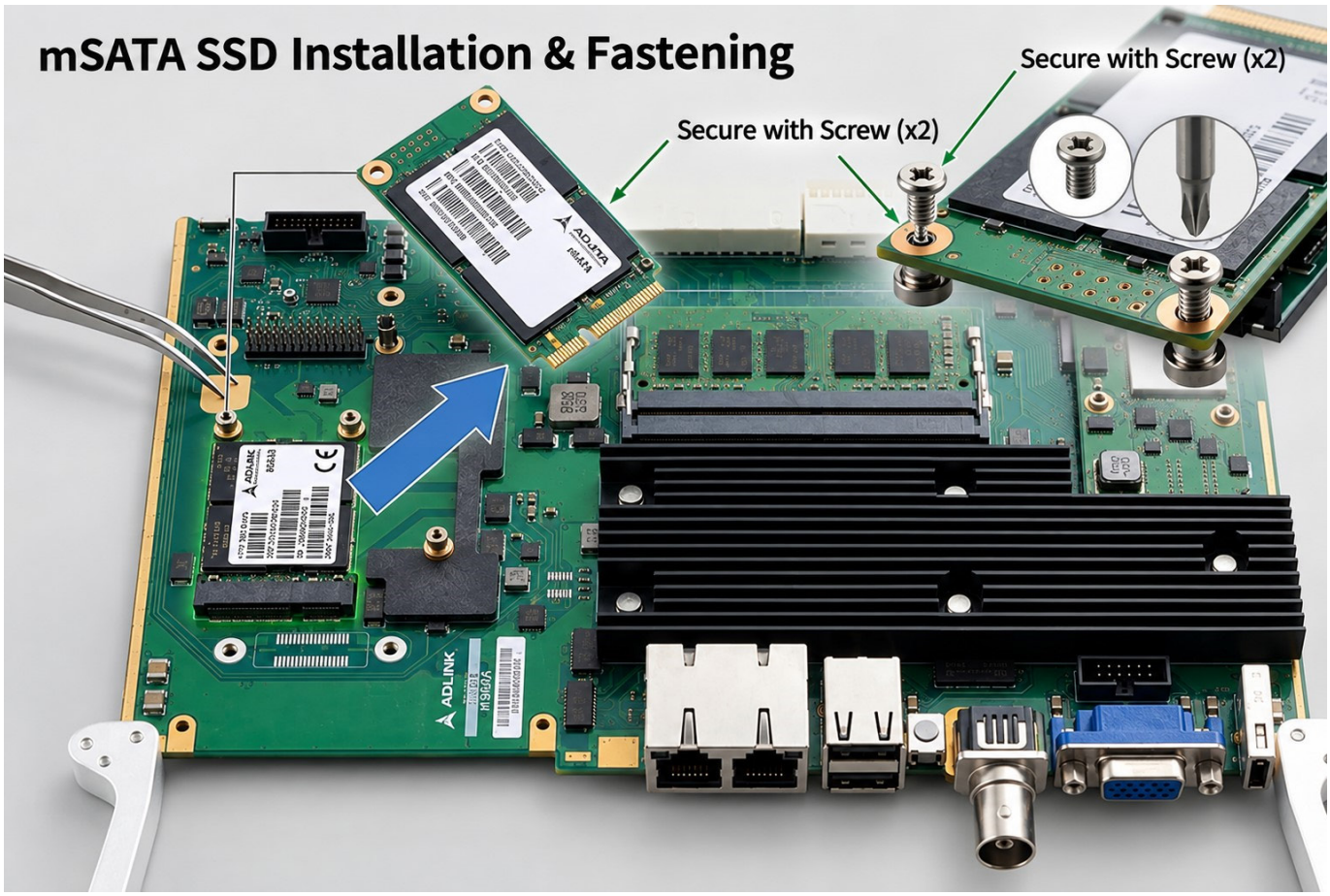


Figure 5: Installing an MSATA drive

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5.2 Power Sequence

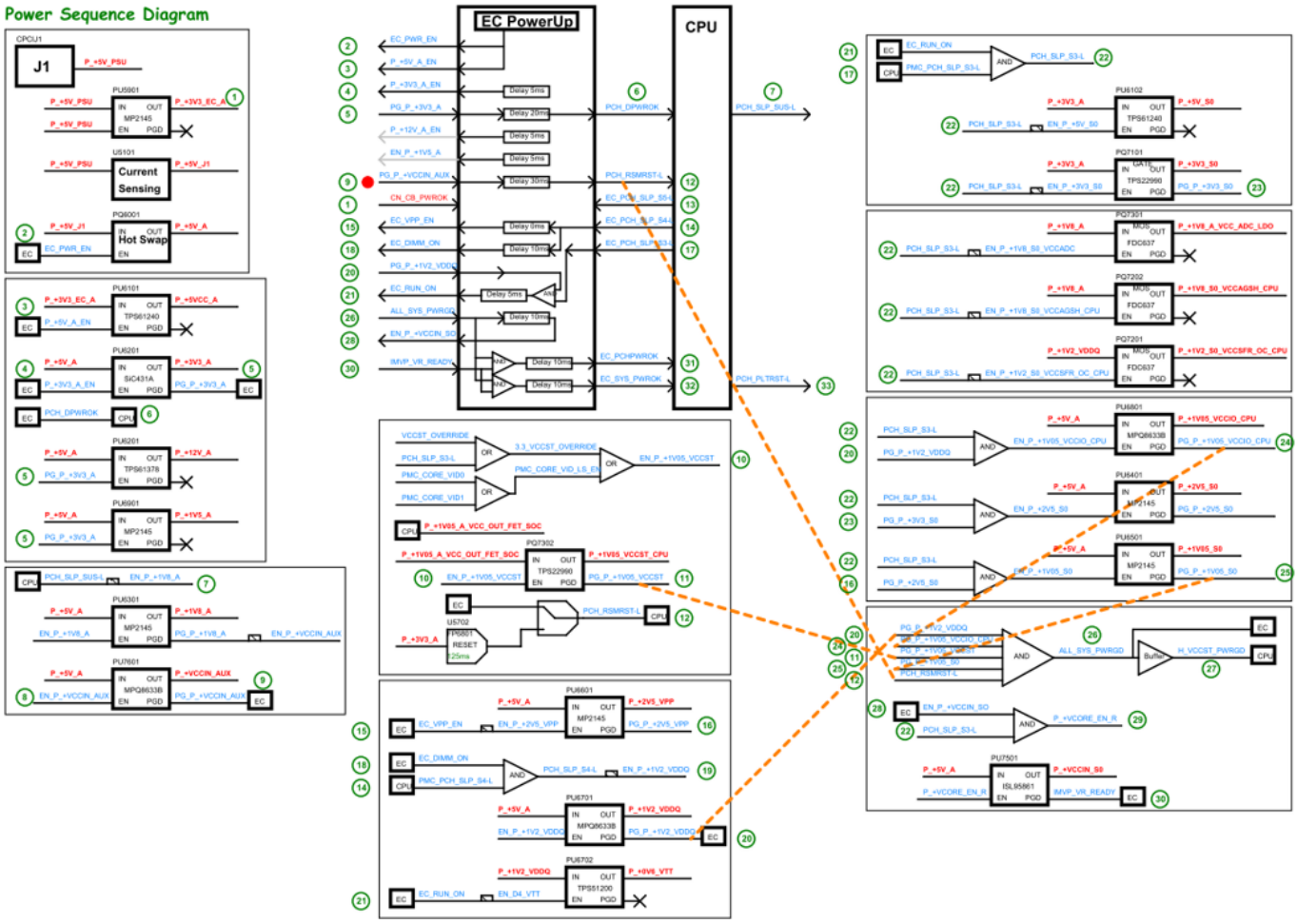


Figure 6: Power sequence diagram

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5.3 Power Consumption

Processor	Intel Atom(R) x6414RE Processor @ 1.50GHz
Chipset	Elkhart Lake
Memory	Transcend 8GB DDR4 3200 ECC-SO-DIMM (TS1GSH72V2BI-ADL) *1
Graphics	Intel® UHD Graphics
HDD	WD WDS250G1B0A-00H9H0 250GB
OS	Windows 10 Enterprise 21H2 64bit
.NET Framework Version	4.8
DirectX	12
BIOS	0.04.10 / 002
Hyper Threading Support	No support
TurboBoost Support	Support
cTDP Setting	Normal
BurnInTest Revision	v9.0 Pro(1011)
TAT Revision	Intel PTAT 1.0.1006
Temperature	Room
Windows Idle mode/Enable EIST	
5V(A)	2.01
Power consumption(W)	10.05
Windows Idle mode/Disable EIST	
5V(A)	2.48
Power consumption(W)	12.4
Windows typical mode/Enable EIST	
5V(A)	3.81
Power consumption(W)	19.05
Windows typical mode/Disable EIST	
5V(A)	3.6
Power consumption(W)	18
Windows MAX mode/Enable EIST	
Package Power reading (TAT)	9.0964
Package Temperature reading (TAT)	No show the value
CPU DTS reading (TAT)	32
CPU frequency reading (TAT)	2699
5V(A)	4.12
Power consumption(W)	20.6
Windows MAX mode/Disable EIST	
Package Power reading (TAT)	8.11237
Package Temperature reading (TAT)	No show the value
CPU DTS reading (TAT)	29

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CPU frequency reading (TAT)	1498
5V(A)	3.97

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6 Driver Installation

The cPCI-6660 drivers are available on the ADLINK website:
https://www.adlinktech.com/Products/SearchResult?lang=en&SiteID=16041112321545803&key=cPCI-6660

ADLINK provides validated drivers for Windows 10 64-bit. We recommend using these drivers to ensure compatibility.

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7 BIOS Settings

The following chapter describes basic navigation for the AMI UEFI BIOS setup utility.

7.1 BIOS Settings Menu

The BIOS setup utility is invoked by pressing <ESC> or <DEL> keys. User can change BIOS settings during setup utility runs. A reset of system is required in order to make new settings take effect.

In BIOS setup utility, there are several hot keys are designed for specific purpose. Hot keys are listed as below.

- <F1>: General help in setup menu
- <F8>: Load previous BIOS values
- <F9>: Load BIOS default in setup utility
- <F10>: Save & Exit setup utility

7.1.1 Menu Selection Bar

The Menu Selection Bar is located at the top of the screen. It displays the top level available menus to the user:

- Main Menu
- Advanced Menu
- Chipset Menu
- Security Menu
- Boot Menu
- Save & Exit Menu

7.1.2 Menu Conventions

The appearance of setup menu listed in this chapter is a sample to describe the item list. It is shown on VT100 terminal via serial console. Followings are the menu conventions.

Using color

The mandatory BIOS setup fields are in black. The BIOS setup fields currently not used are in grey. The display only strings are in black.

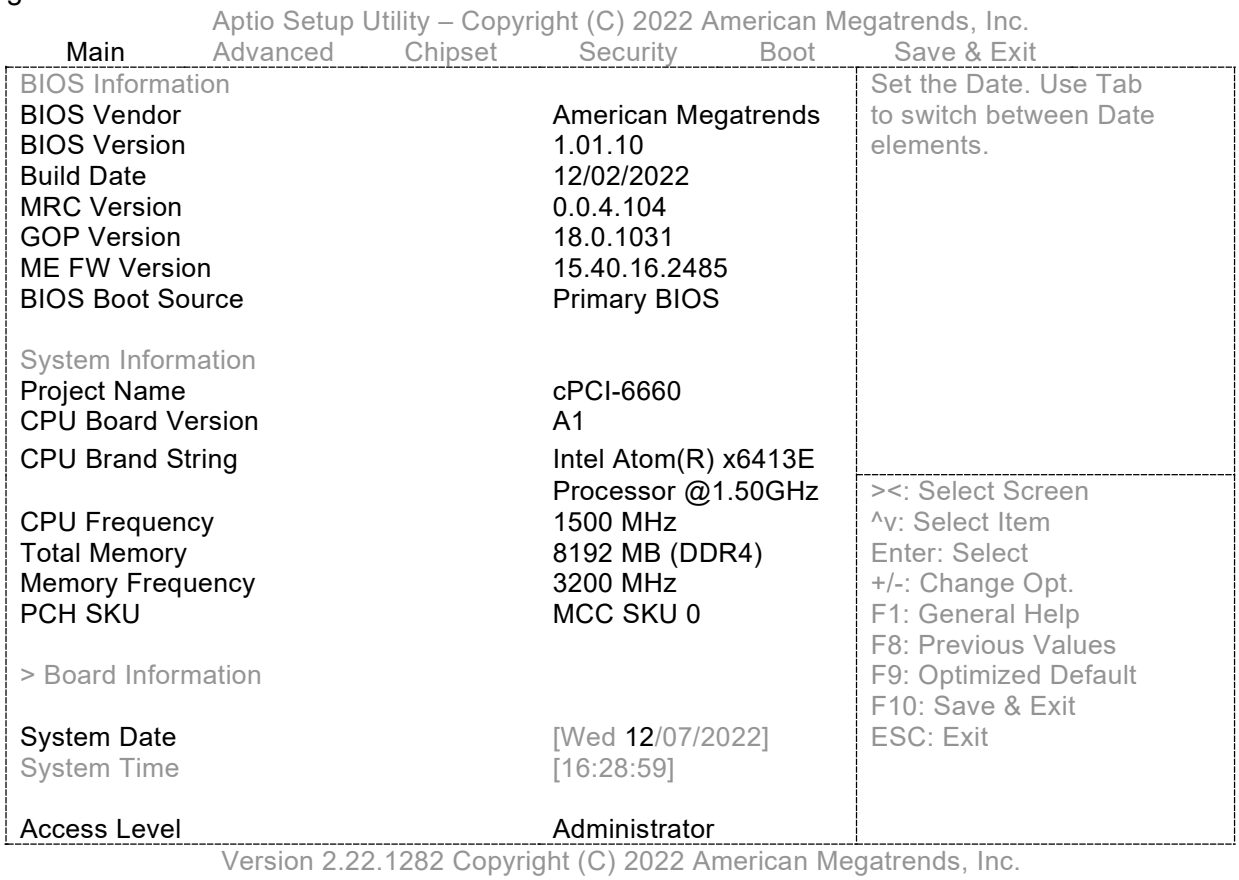
Using brackets

Editable menu options are marketed with squares ‘[‘ and ‘]’ to distinguish them from display only fields that can’t be modified.

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7.2 Main Menu

The Main Menu provides read-only information about system and also allows to set system's date and time. Refer to the tables below, it shows the screen shot of Main menu for detail, and submenus and settings as well.



7.2.1 BIOS Information

BIOS Item	Options	Description
BIOS Vendor	**Info-only.** American Megatrends	Display vendor name of system BIOS.
BIOS Version	**Info-only.** x.yy.zz	Display version of booting BIOS.
Build Date	**Info-only.** MM/DD/YYYY	It shows the date that BIOS was built.
MRC Version	**Info-only.** w.x.y.z	Display the revision of MRC code which is implemented in BIOS.
GOP Version	**Info-only.** x.y.zzzz	*GOP Version:* When video option ROM is set to "UEFI Only", it will show up.
ME FW Version	**Info-only.** ww.x.yy.zzzz	Display the version of Intel manageability firmware which is implemented in BIOS.
BIOS Boot Source	**Info-only.** Primary BIOS/Backup BIOS	It shows which BIOS flash boots the system. *Primary BIOS:* usually means that boots from SPI0 *Backup BIOS:* usually means that boots from SPI1

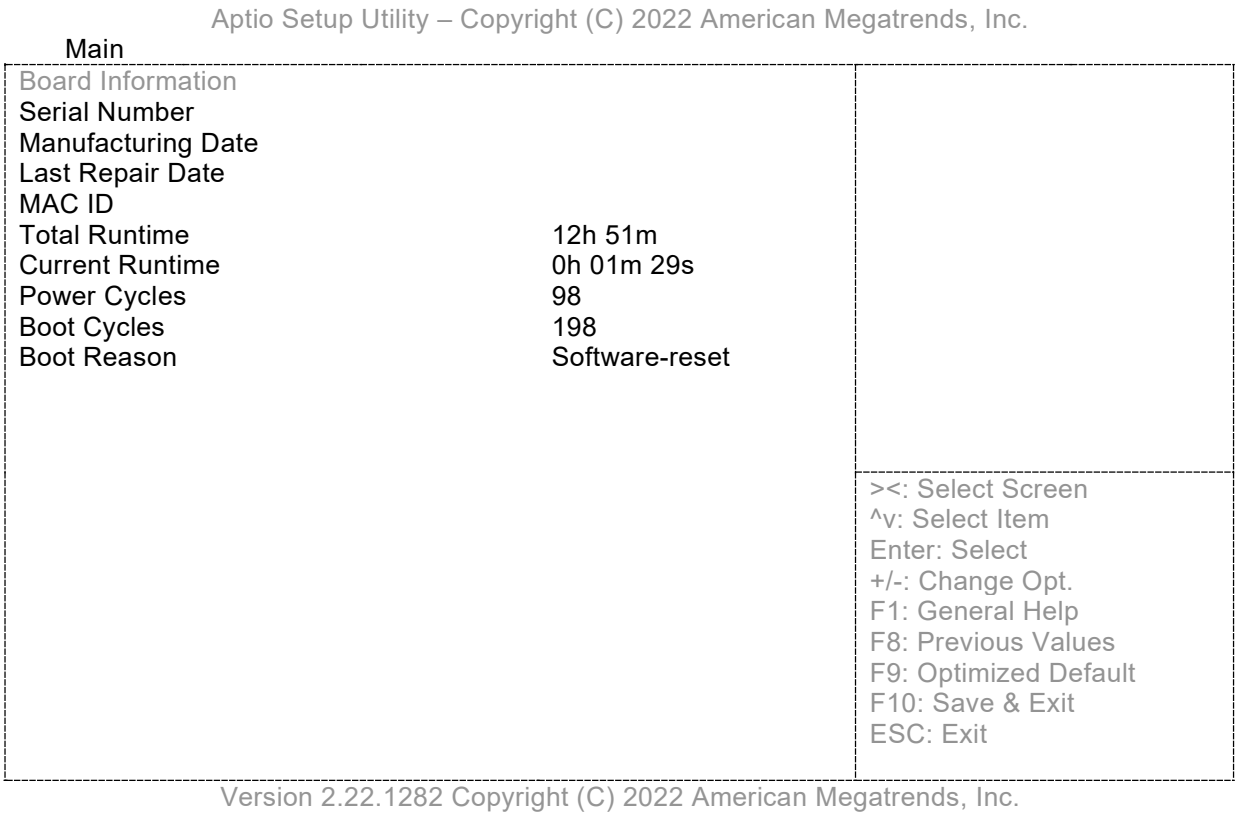
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7.2.2 System Information

BIOS Item	Options	Description
Project Name	**Info-only.**	It shows the project name.
CPU Board Version	**Info-only.** A1/A2/A3/…	It shows the CPU board HW version.
CPU Brand String	**Info-only.** Intel(R) Core, …	It shows what CPU is booting the system.
CPU Frequency	**Info-only.** XXXX MHz	It shows CPU's frequency.
Total Memory	**Info-only.** XXXX MB (DDRx)	It shows total memory size used on the motherboard and memory type.
Memory Frequency	**Info-only.** XXXX MHz	It shows memory's frequency.
PCH SKU	**Info-only.** QMxx	It shows what PCH SKU is designed on motherboard.

BIOS Item	Options	Description
System Date	MM/DD/YYYY	For configuring/showing system date. When setting the Date, use <Tab> key to switch between Date elements.
System Time	HH:MM:SS	For configuring/showing system time. When setting the Time, use <Tab> key to switch between Time elements.
Access Level	**Info-only.** Administrator/User	It shows what access level is used to enter BIOS setup menu.

7.2.3 Submenu: Board Information

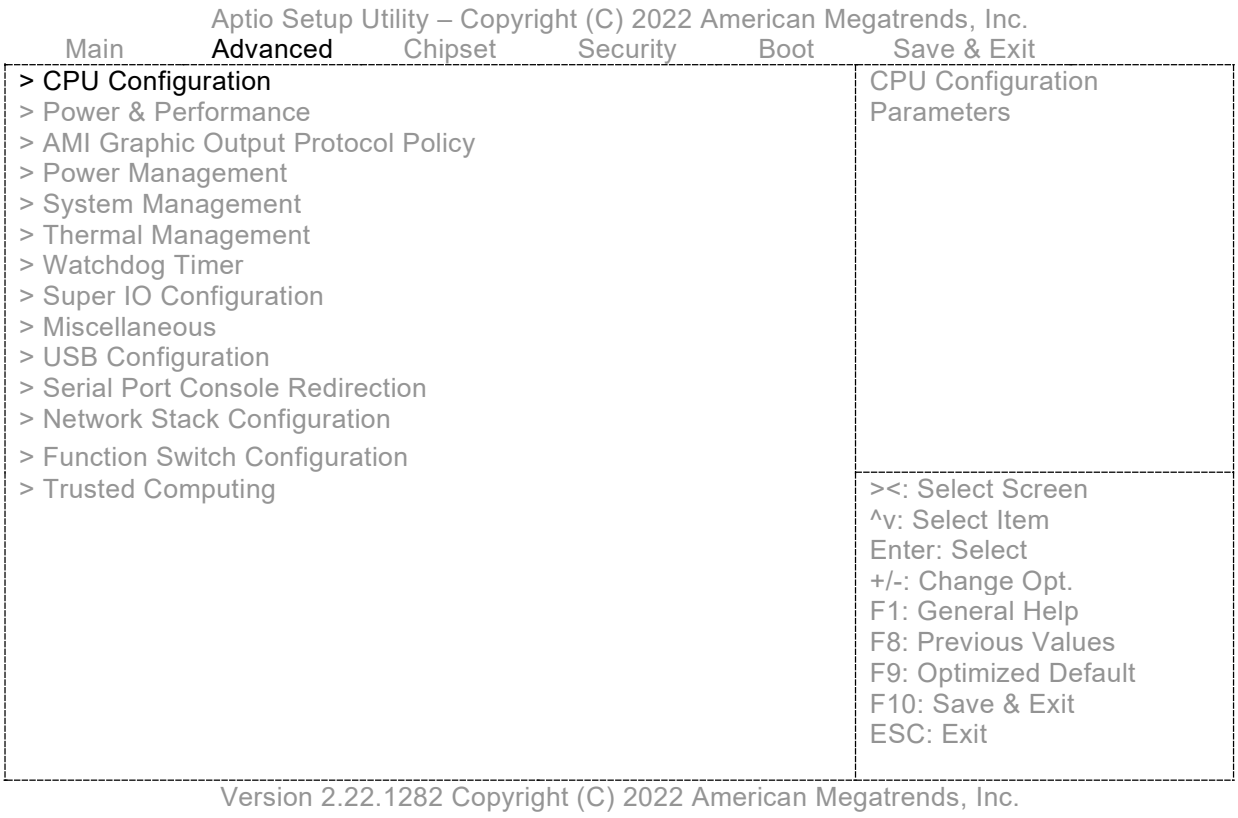


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BIOS Item	Options	Description
Serial Number	**Info-only.**	Display board's serial number.
Manufacturing Date	**Info-only.**	Display manufacturing date.
Last Repair Date	**Info-only.**	Display Last Repair Date.
MAC ID	**Info-only.**	Shows onboard Ethernet's MAC ID.
Total Runtime	**Info-only.**	The returned value specifies the total time in minutes the system is running in S0 state.
Current Runtime	**Info-only.**	The returned value specifies the time in seconds the system is running in S0 state. This counter is cleared when the system is removed from the external power supply.
Power Cycle	**Info-only.**	The returned value specifies the number of times the external power supply has been shut down.
Boot Cycles	**Info-only.**	The boot cycle is increased after a HW or SW reset or after a successful power-up.
Boot Reason	**Info-only.**	The boot reason is the event which causes the reboot of the system.

7.3 Advanced Menu

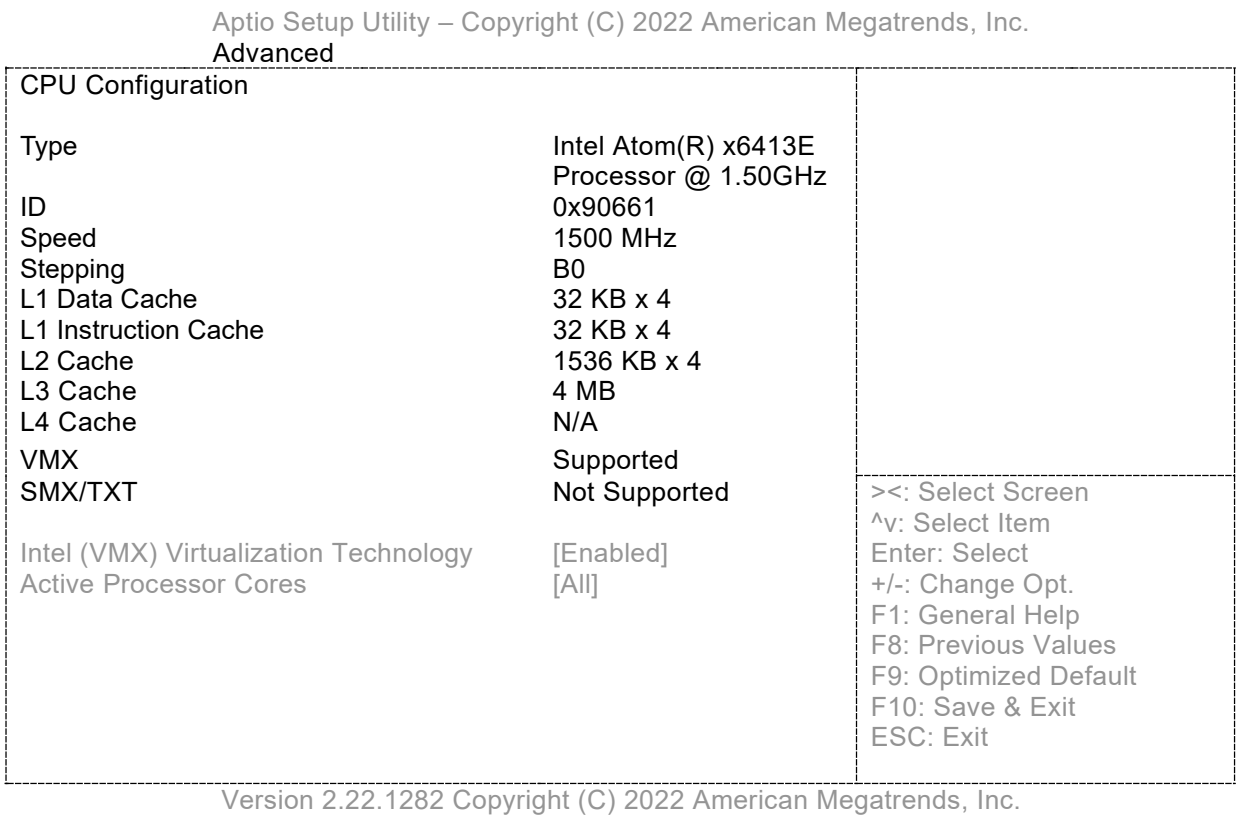
This menu contains the settings for most of the user interfaces in the system.



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BIOS Item	Options	Description
CPU Configuration	**Submenu**	For configuring CPU features/functions.
Power & Performance	**Submenu**	For Power & Performance Options
AMI Graphic Output Protocol Policy	**Submenu**	User Select Monitor Output by Graphic Output Protocol
Power Management	**Submenu**	For Power Management
System Management	**Submenu**	ADLINK SEMA Information
Thermal Management	**Submenu**	For Thermal Management
Watchdog Timer	**Submenu**	For configuring Watchdog Timer parameter
Super IO Configuration	**Submenu**	Set Parameters of Super IO device.
Miscellaneous	**Submenu**	For Miscellaneous Device
USB Configuration	**Submenu**	For USB Configuration setting.
Serial Port Console Redirection	**Submenu**	Set Parameters of Serial Console Redirection.
Network Stack Configuration	**Submenu**	Enabled/Disable Network Stack
Function Switch Configuration	**Submenu**	For SW control VGA/LAN/SATA1/SATA2/COM1/COM2 output path or settings
Trusted Computing	**Submenu**	For TPM related settings

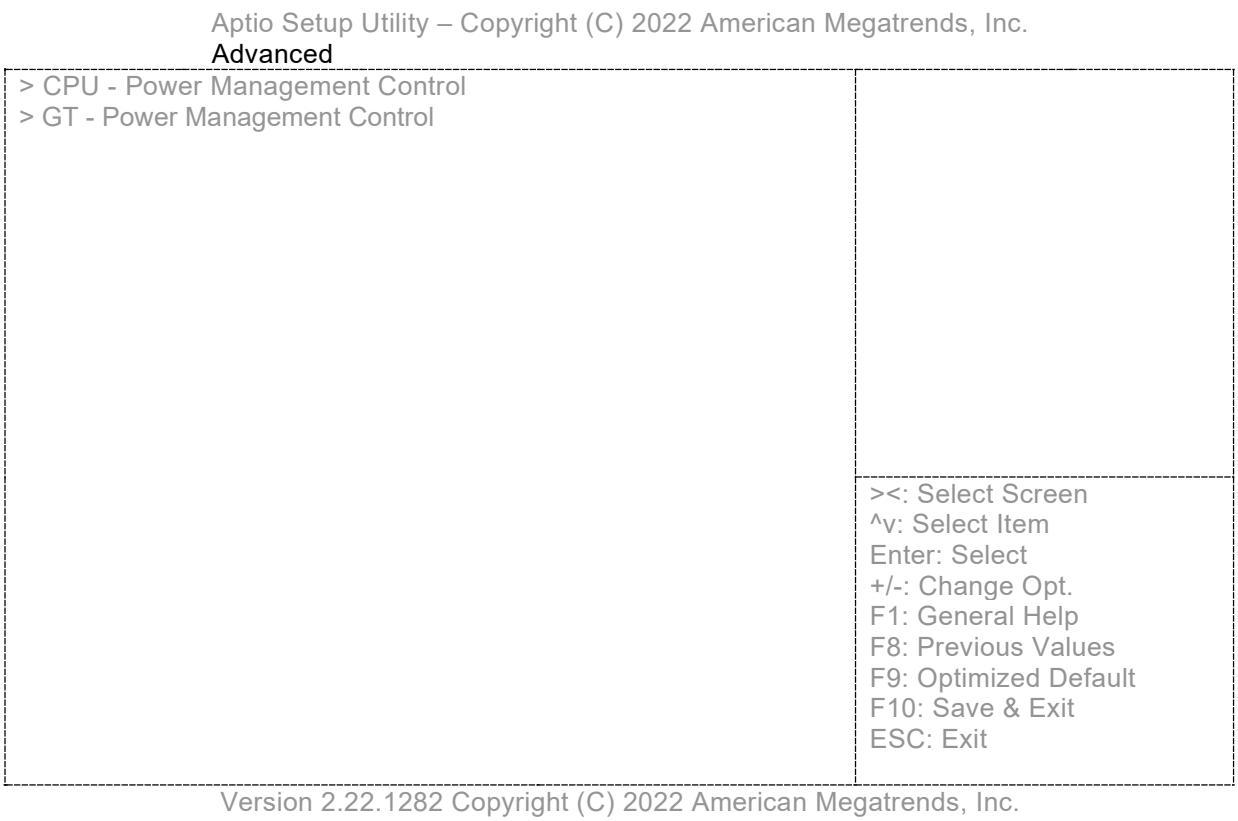
7.3.1 CPU Configuration



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BIOS Item	Options	Description
Intel (VMX) Virtualization Technology	**Enabled** Disabled	When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.
Active Processor Cores	**All** 1 2 3	Number of cores to enable in each processor package.

7.3.2 Power & Performance



BIOS Item	Options	Description
CPU - Power Management Control	**Submenu**	CPU - Power Management Control Options
GT - Power Management Control	**Submenu**	GT - Power Management Control Options

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7.3.2.1 Power & Performance > CPU – Power Management Control

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CPU – Power Management Control		
P0 Fused Max Core Ration	N/A	
P1 Fused Max Core Ration	N/A	
P2 Fused Max Core Ration	N/A	
P3 Fused Max Core Ration	N/A	
Boot performance mode	[Max Non-Turbo Performance]	
Intel® SpeedStep™	[Enabled]	
Race to Halt(RTH)	[Enabled]	
Intel® Speed Shift Technology	[Enabled]	
HwP Atuonomous EPP Grouping	[Enabled]	
EPB override over PECI	[Disabled]	
HwP Fast MSR Support	[Enabled]	
HDC Control	[Enabled]	
Turbo Mode	[Enabled]	
> View/Configure Turbo Options		
> CPU VR settings		><: Select Screen
Platform PL1 Enable	[Disabled]	^v: Select Item
Platform PL2 Enable	[Disabled]	Enter: Select
Power Limit 4 Override	[Disabled]	+/-: Change Opt.
C states	[Enabled]	F1: General Help
Enhanced C-states	[Enabled]	F8: Previous Values
C-State Auto Demotion	[C1]	F9: Optimized Default
C-state Un-demotion	[C1]	F10: Save & Exit
Package C-state Demotion	[Enabled]	ESC: Exit
Package C-state Un-demotion	[Enabled]	
CState Pre-Wake	[Enabled]	
IO MWAIT Redirection	[Disabled]	
Package C State Limit	[Auto]	
C6/C7 Short Latency Control(MSR 0x60B)	[1024 ns]	
Time Unit	0	
Latency		
C6/C7 Short Latency Control(MSR 0x60C)	[1024 ns]	
Time Unit	0	
Latency	[1024 ns]	
C8 Short Latency Control(MSR 0x633)	0	
Time Unit		
Latency	[1024 ns]	
C9 Short Latency Control(MSR 0x634)	0	
Time Unit		
Latency	[1024 ns]	
C10 Short Latency Control(MSR 0x635)	0	
Time Unit	[Enabled]	
Latency	[Fixed Priority]	
Thermal Monitor	[Disabled]	
Interrupt Redirection Mode Selection		
Timed MWAIT	[Disabled]	
> Custom P-state Table	[Disabled]	
EC Turbo Control Mode	26	
Energy Performance Gain	11	
EPG DIMM Idd3N		
EPG DIMM Idd3P		
> Power Limit 3 Settings		
> CPU Lock Configuraiton		

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BIOS Item	Options	Description
P0 Fused Max Core Ration	**Info-only**	
P1 Fused Max Core Ration	**Info-only**	
P2 Fused Max Core Ration	**Info-only**	
P3 Fused Max Core Ration	**Info-only**	
Boot performance mode	Max Battery **Max Non-Turbo Performance** Turbo Performance	Select the performance state that the BIOS will set starting from reset vector.
Intel® SpeedStep™	Disabled **Enabled**	Allows more than two frequency ranges to be supported.
Race to Halt(RTH)	Disabled **Enabled**	Enable/Disable Race To Halt feature. RTH will dynamically increase CPU frequency in order to enter pkg C-state faster to reduce overall power. (RTH is controlled through MSR 1FV bit 20)
Intel® Speed Shift Technology	Disabled **Enabled**	Enable/Disable Intel® Speed Shift Technology support. Enabling will expose the CPPCv2 interface to allow for hardware controlled P-states.
HwP Atuonomous EPP Grouping	Disabled **Enabled**	Enable EPP grouping (default Bit 29=0, command x11) Autonomous will request the same values for all cores with same EPP. Disable EPP grouping (Bit 29 = 1, command 0x11) autonomous will not necessarily request same values for all cores with same EPP.
EPB override over PECI	**Disabled** Enabled	Enable/Disable EPB override over PECI. Enable by sending pcode command 0x2b, subcommand 0x3 to 1. This will allow OOB EPB PECI override control.
HwP Fast MSR Support	Disabled **Enabled**	Enable/Disable HwP Fast MSR Support for IA32_HWP_REQUEST MSR.
HDC Control	Disabled **Enabled**	This option allows HDC configuration. Disabled: Disable HDC Enabled: Can be enabled by OS if OS native support is available.
Turbo Mode	Disabled **Enabled**	Enable/Disable processor Turbo Mode (requires EMTTM enabled too). AUTO means enabled.
>View/Configure Turbo Options	**Submenu**	
> CPU VR settings	**Submenu**	
Platform PL1 Enable	**Disabled** Enabled	Enable/Disable Platform Power Limit 1 programming. If this option is enabled, it activates the PL1 value to be used by the processor to limit the average power of given time window.
Platform PL2 Enable	**Disabled** Enabled	Enable/Disable Platform Power Limit 2 programming. If this option is disabled, BIOS will program the default values for Platform Power Limit 2.
Power Limit 4 Override	**Disabled** Enabled	Enable/Disable Power Limit 4 override. If this option is disabled, BIOS will leave the default values for Power Limit 4.
C states	Disabled **Enabled**	Enable/Disable CPU Power Management. Allows CPU to go to C states when it's not 100% utilized.
Enhanced C-states	Disabled **Enabled**	Enable/Disable C1E. When enabled, CPU will switch to minimum speed when all cores enter C-State
C-State Auto Demotion	Disabled **C1**	Configure C-State Auto Demotion
C-state Un-demotion	Disabled **C1**	Configure C-State Un-demotion
Package C-state Demotion	Disabled **Enabled**	Package C-State Demotion
Package C-state Un-demotion	Disabled **Enabled**	Package C-State Un-demotion

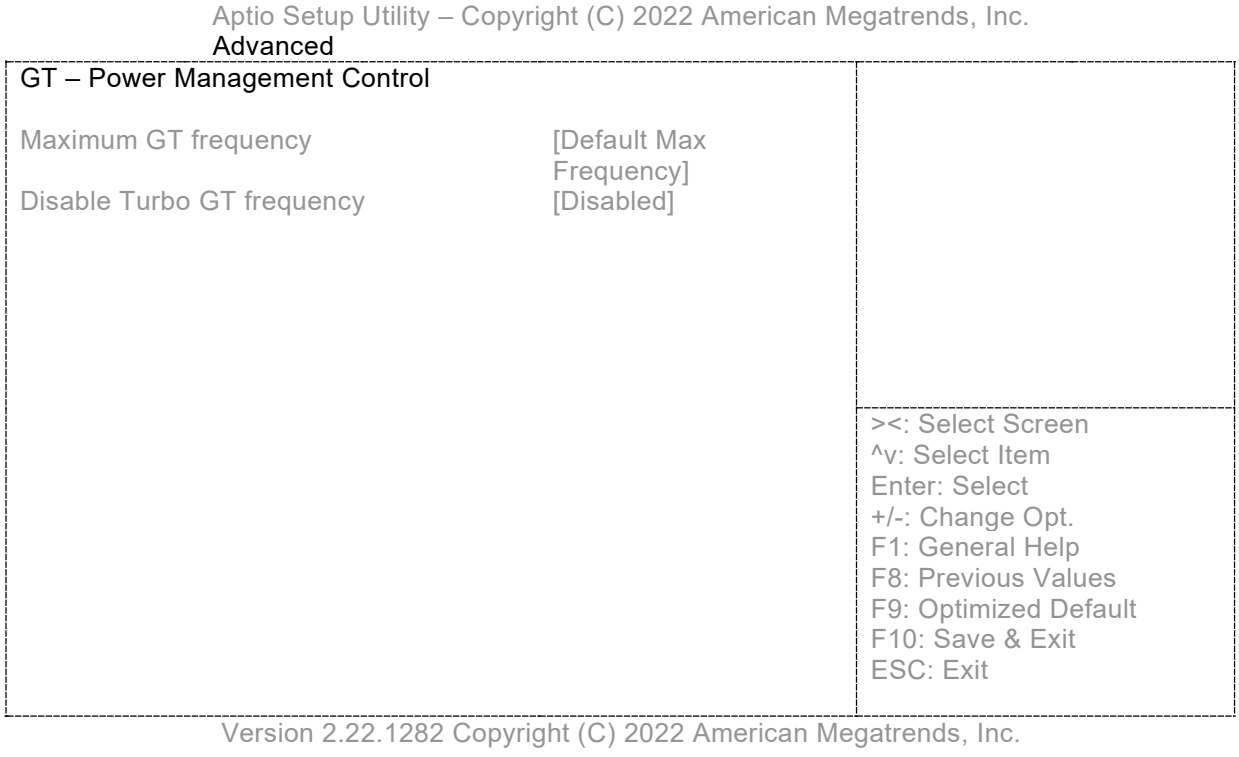
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CState Pre-Wake	Disabled **Enabled**	Disable – Sets bit 30 of POWER_CTL MSR(0x1FC) to 1 to disable the Cstate Pre-Wake
IO MWAIT Redirection	**Disabled** Enabled	When set, will map IO_read instructions sent to IO refisters PMG_IO_BASE_ADDRBASE+offset to MWAIT(offset)
Package C State Limit	C0/C1 C2 C3 C6 C7 C7S C8 C9 C10 Cpu Default **Auto**	Maximum Package C state Limit Setting. Cpu Default: Leaves to Factory default value. Auto: Initializes to deepest available package C State Limit.
C6/C7 Short Latency Control(MSR 0x60B)	**Info-only**	
Time Unit	1 ns 32 ns **1024 ns** 32768 ns 1048576 ns 33554432 ns	Unit of measurement for IRTL value – bits [12:10]
Latency	**0**	Interrupt Response Time Limit value – bits [9:0], Enter 0-1023
C6/C7 Short Latency Control(MSR 0x60C)	**Info-only**	
Time Unit	1 ns 32 ns **1024 ns** 32768 ns 1048576 ns 33554432 ns	Unit of measurement for IRTL value – bits [12:10]
Latency	**0**	Interrupt Response Time Limit value – bits [9:0], Enter 0-1023
C8 Short Latency Control(MSR 0x633)	**Info-only**	
Time Unit	1 ns 32 ns **1024 ns** 32768 ns 1048576 ns 33554432 ns	Unit of measurement for IRTL value – bits [12:10]
Latency	**0**	Interrupt Response Time Limit value – bits [9:0], Enter 0-1023
C9 Short Latency Control(MSR 0x634)	**Info-only**	
Time Unit	1 ns 32 ns **1024 ns** 32768 ns 1048576 ns 33554432 ns	Unit of measurement for IRTL value – bits [12:10]
Latency	**0**	Interrupt Response Time Limit value – bits [9:0], Enter 0-1023
C10 Short Latency Control(MSR 0x635)	**Info-only**	
Time Unit	1 ns 32 ns **1024 ns** 32768 ns 1048576 ns 33554432 ns	Unit of measurement for IRTL value – bits [12:10]
Latency	**0**	Interrupt Response Time Limit value – bits [9:0], Enter 0-1023
Thermal Monitor	Disabled	Enable/Disable Thermal Monitor

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	Enabled	
Interrupt Redirection Mode Selection	**Fixed Priority** Round robin Hash Vector No Change	Interrupt Redirection Mode Select for Logical Interrupts
Timed MWAIT	**Disabled** Enabled	Enable/Disable Timed MWAIT Support
> Custom P-state Table	**Submenu**	
EC Turbo Control Mode	**Disabled** Enabled	Enable/Disable EC Turbo Control mode
Energy Performance Gain	**Disabled** Enabled	Enable/Disable Energy Performance Gain.
EPG DIMM Idd3N	**Info-only**	
EPG DIMM Idd3P	**Info-only**	
> Power Limit 3 Settings	**Info-only**	
> CPU Lock Configuraiton	**Submenu**	

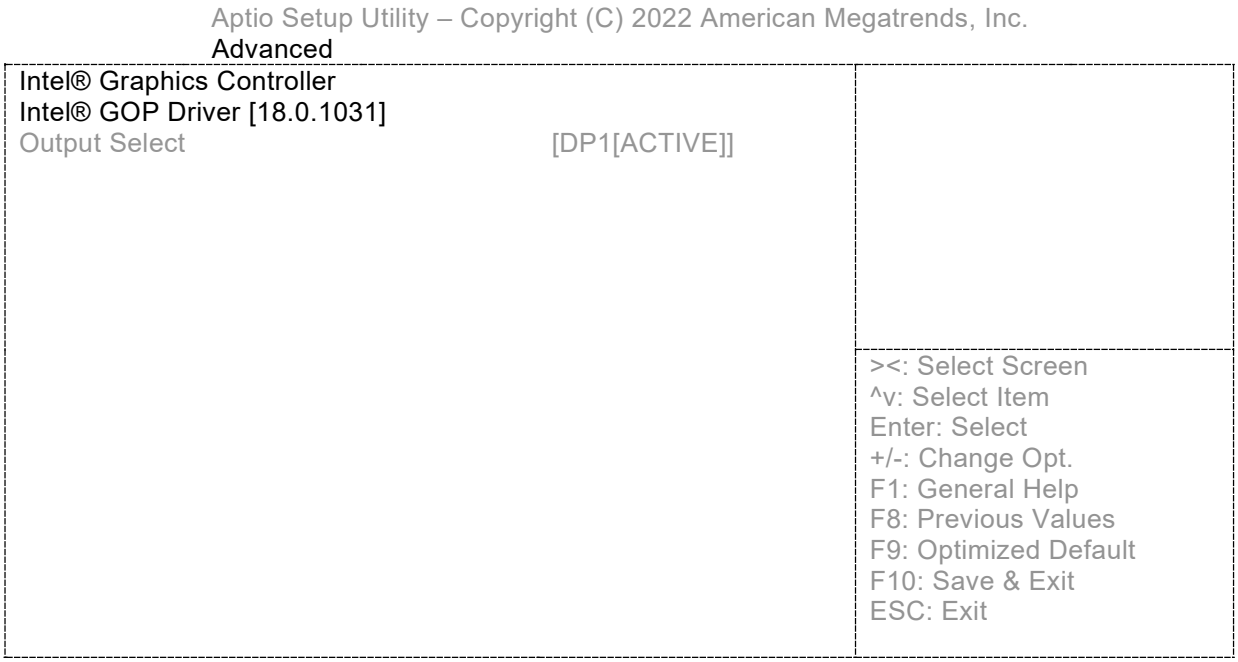
7.3.2.2 Power & Performance > GT – Power Management Control



BIOS Item	Options	Description
Maximum GT frequency	**Default Max Frequency** 100Mhz 150Mhz ……. 1150Mhz 1200Mhz	Maximum GT frequency limited by the user. Choose between 200Mhz (RPN) and 750Mhz (RP0). Value beyond the range will be clipped to min/max supported by SKU.
Disable Turbo GT frequency	Enabled **Disabled**	Enabled: Disables Turbo GT frequency. Disabled: GT frequency is not limited.

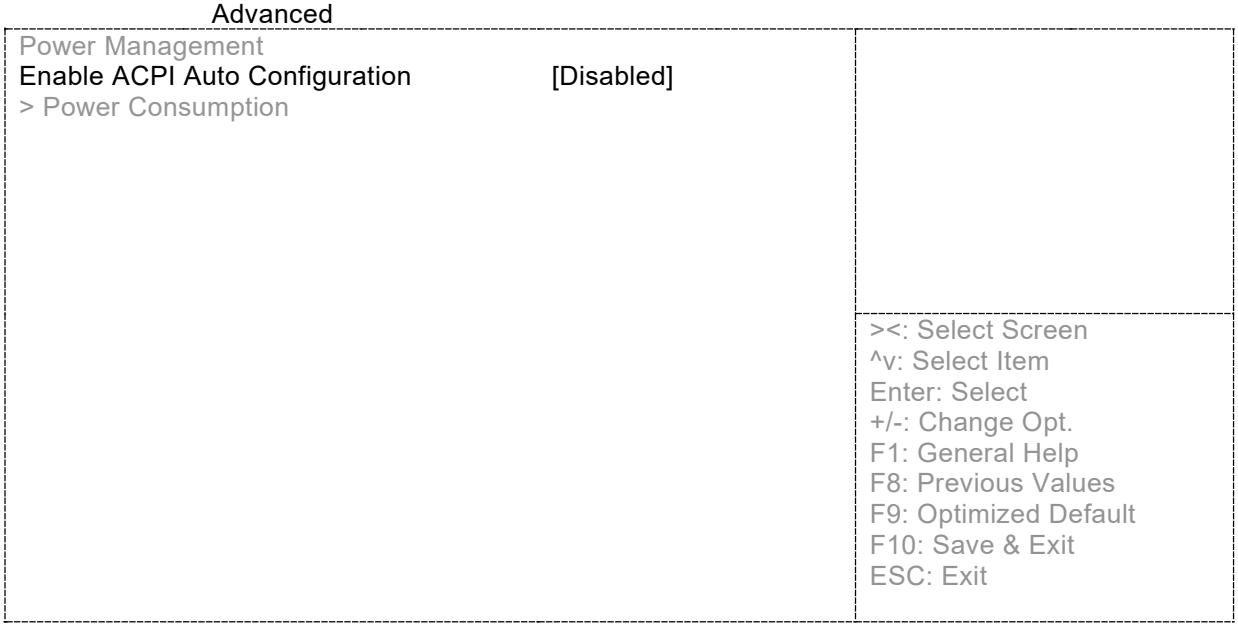
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7.3.3 AMI Graphic Output Protocol Policy



BIOS Item	Options	Description
Intel® Graphics Controller	**Info-only**	
Output Select	**[DP1[ACTIVE]]**	Output Interface

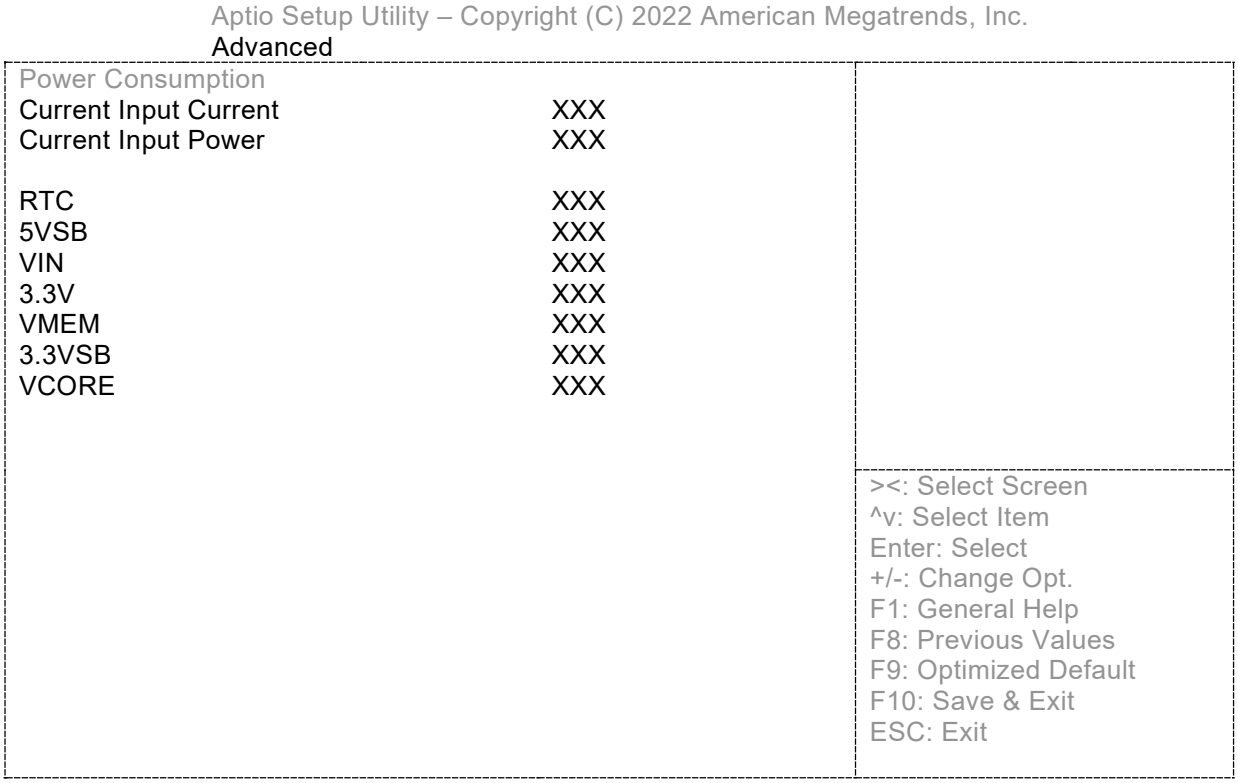
7.3.4 Power Management



BIOS Item	Options	Description
Enable ACPI Auto Configuration	**Disabled** Enabled	Enable/disable BIOS ACPI auto configuration function.
Power Consumption	**Submenu**	

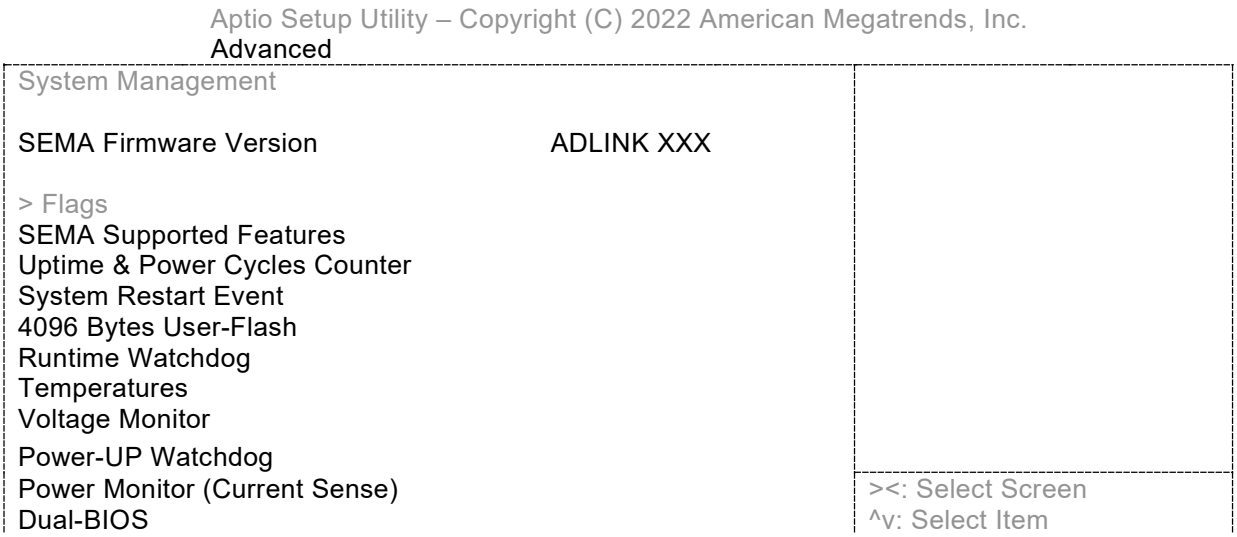
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7.3.4.1 Power Management > Power Consumption



BIOS Item	Options	Description
Power Consumption	**Info-only**	Indicate this is the page to show power consumption on system.
Current Input Current	**Read only**	Display current input current.
Current Input Power	**Read only**	Display current input power.
RTC	**Read only**	Display RTC voltage.
5VSB	**Read only**	Display 5VSB voltage.
VIN	**Read only**	Display VIN voltage.
3.3V	**Read only**	Display 3.3V voltage.
VMEM	**Read only**	Display VMEM voltage.
3.3VSB	**Read only**	Display 3.3VSB voltage.
VCORE	**Read only**	Display VCORE voltage.

7.3.5 System Management



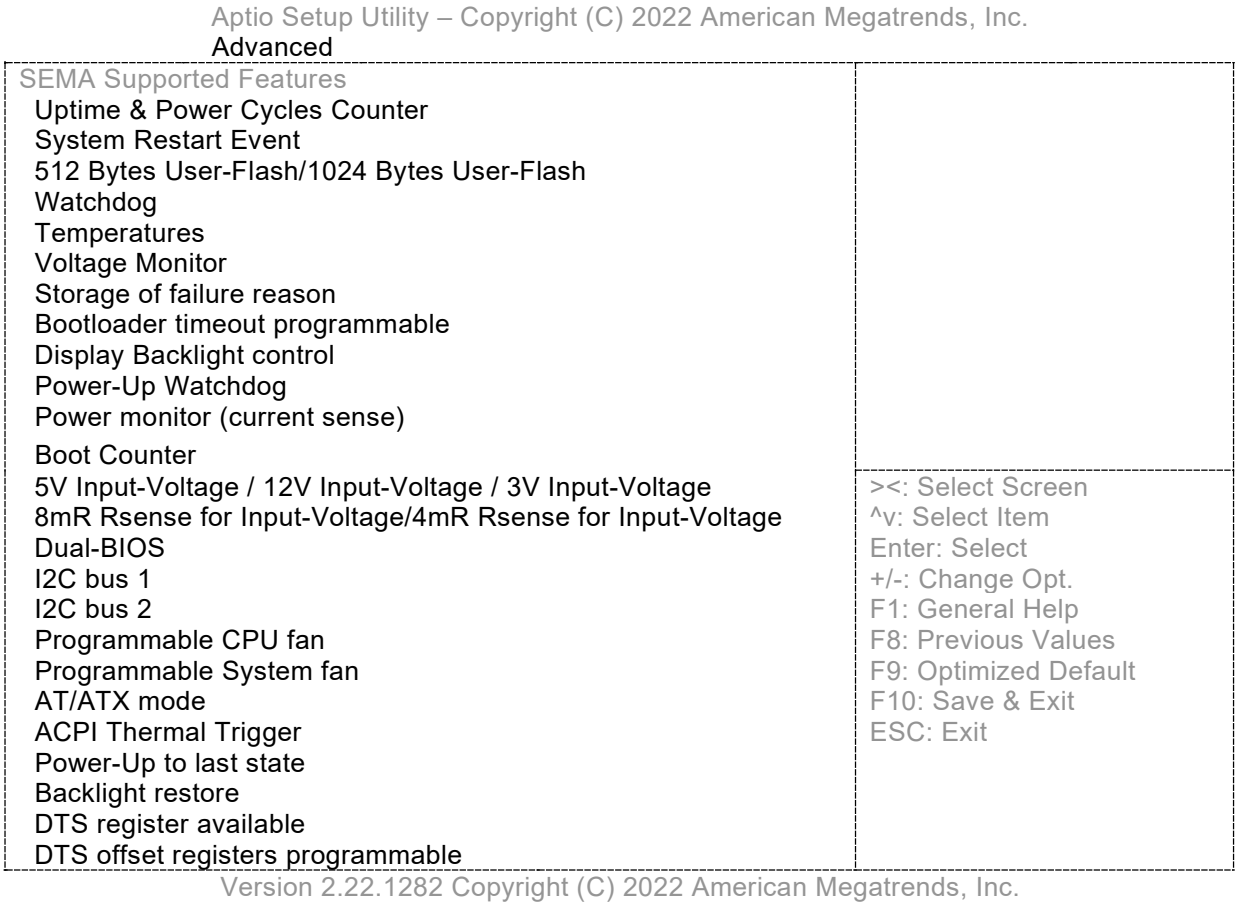
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BIOS Item	Options	Description
System Management	**Info-only**	
SEMA Firmware Version	**Info-only**	Display EC version
Flags	**Submenu**	
SEMA Supported Features	**Info-only**	SEMA provides many features for selection. Following reported feature is to indicate that the feature is implemented on system
Uptime & Power Cycles Counter	**Info-only**	If this item is shown, it means SEMA supports “Uptime & Power Cycles counter”.
System Restart Event	**Info-only**	If this item is shown, it means SEMA supports “System Reset Event”.
4096 Bytes User-Flash	**Info-only**	If this item is shown, it means SEMA supports “4096 Bytes User-Flash”.
Runtime Watchdog	**Info-only**	If this item is shown, it means SEMA supports “Runtime Watchdog”.
Temperatures	**Info-only**	If this item is shown, it means SEMA supports “Temperature”.
Voltage Monitor	**Info-only**	If this item is shown, it means SEMA supports “Voltage Monitor”.
Power-UP Watchdog	**Info-only**	If this item is shown, it means SEMA supports “Power-up Watchdog”.
Power Monitor (Current Sense)	**Info-only**	If this item is shown, it means SEMA supports “Power Monitor (current sense)”.
Dual-BIOS	**Info-only**	If this item is shown, it means SEMA supports “Dual-BIOS”.
I2C Bus 1	**Info-only**	If this item is shown, it means SEMA supports “I2C bus 1”.
I2C Bus 2	**Info-only**	If this item is shown, it means SEMA supports “I2C bus 2”.
I2C Bus 3	**Info-only**	If this item is shown, it means SEMA supports “I2C bus 3”.
ACPI Thermal Trigger	**Info-only**	If this item is shown, it means SEMA supports “ACPI Thermal Trigger”.
Power-up to Last State	**Info-only**	If this item is shown, it means SEMA supports “Power-up to last state”.
Other BMC	**Info-only**	If this item is shown, it means SEMA supports “Other BMC”.
Error Log	**Info-only**	If this item is shown, it means SEMA supports “Error Log”.
Wake-by-BMC	**Info-only**	If this item is shown, it means SEMA supports “Wake-by-BMC”.
Parameter Memory	**Info-only**	If this item is shown, it means SEMA supports “Parameter Memory”.

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7.3.5.1 System Management > SEMA Features

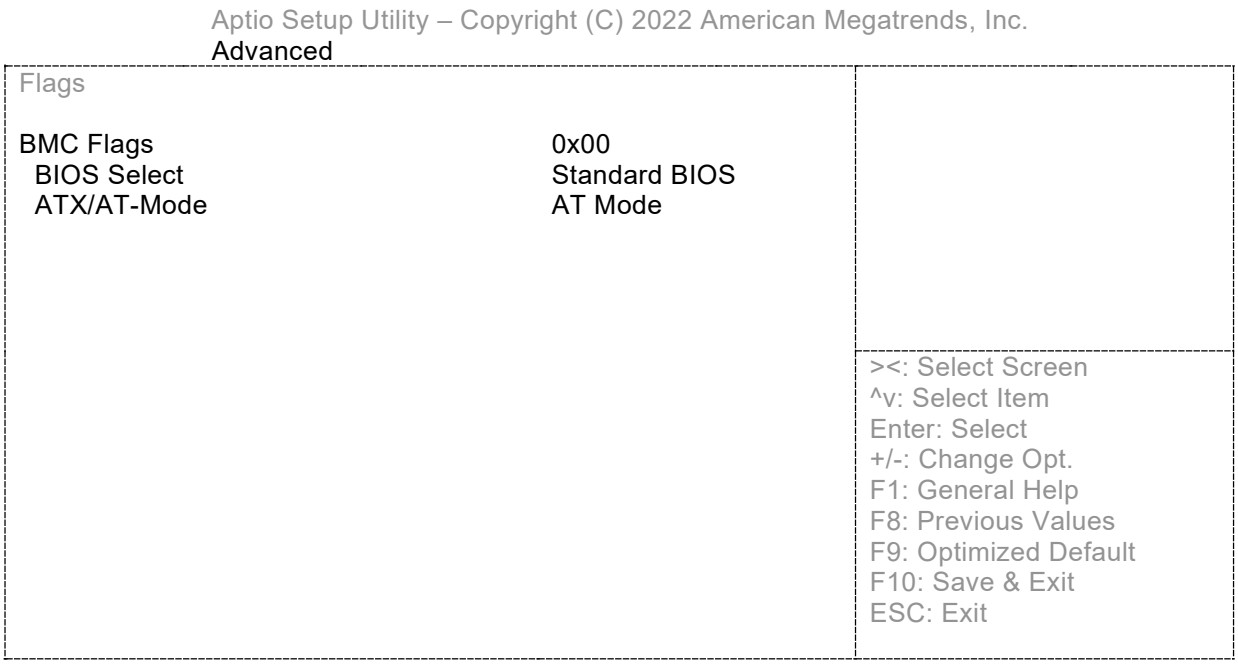


BIOS Item	Options	Description
SEMA Supported Features	**Info-only**	SEMA provides many features for selection. Following reported feature is to indicate that the feature is implemented on system.
Uptime & Power Cycles Counter	**Info-only**	If this item is shown, it means SEMA supports “Uptime & Power Cycles counter”.
System Reset Event	**Info-only**	If this item is shown, it means SEMA supports “System Reset Event”.
User-Flash size	**Info-only**	It will show 512 bytes or 1024 bytes depends on the design.
Watchdog	**Info-only**	If this item is shown, it means SEMA supports “Watchdog”.
Temperatures	**Info-only**	If this item is shown, it means SEMA supports “Temperature”.
Voltage Monitor	**Info-only**	If this item is shown, it means SEMA supports “Voltage Monitor”.
Storage of failure reason	**Info-only**	If this item is shown, it means SEMA supports “Storage of failure reason”.
Bootloader timeout programmable	**Info-only**	If this item is shown, it means SEMA supports “Bootloader timeout programmable”.
Display Backlight control	**Info-only**	If this item is shown, it means SEMA supports “Display Backlight control”.
Power-up Watchdog	**Info-only**	If this item is shown, it means SEMA supports “Power-up Watchdog”.
Power Monitor (current sense)	**Info-only**	If this item is shown, it means SEMA supports “Power Monitor (current sense)”.
Boot Counter	**Info-only**	If this item is shown, it means SEMA supports “Boot Counter”.
Input Voltage	**Info-only**	It will show 5V, 12V or 3V depends on the design.
Rsense of Power Monitor	**Info-only**	It will show 8mR or 4mR depends on the design.
Dual BIOS	**Info-only**	If this item is shown, it means SEMA supports “dual BIOS”.

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I2C bus 1	**Info-only**	If this item is shown, it means SEMA supports “I2C bus 1”.
I2C bus 2	**Info-only**	If this item is shown, it means SEMA supports “I2C bus 2”.
AT/ATX mode	**Info-only**	If this item is shown, it means SEMA supports “AT/ATX mode”.
ACPI Thermal Trigger	**Info-only**	If this item is shown, it means SEMA supports “ACPI Thermal Trigger”.
Power-up to last state	**Info-only**	If this item is shown, it means SEMA supports “Power-up to last state”.
Backlight restore	**Info-only**	If this item is shown, it means SEMA supports “Backlight restore”.
DTS register	**Info-only**	If this item is shown, it means SEMA supports “DTS register”.
DTS offset registers	**Info-only**	If this item is shown, it means SEMA supports “DTS offset registers”.
GPIO	**Info-only**	If this item is shown, it means SEMA supports “GPIO”.
I2C bus 3	**Info-only**	If this item is shown, it means SEMA supports “I2C bus 3”.
I2C bus 4	**Info-only**	If this item is shown, it means SEMA supports “I2C bus 4”.

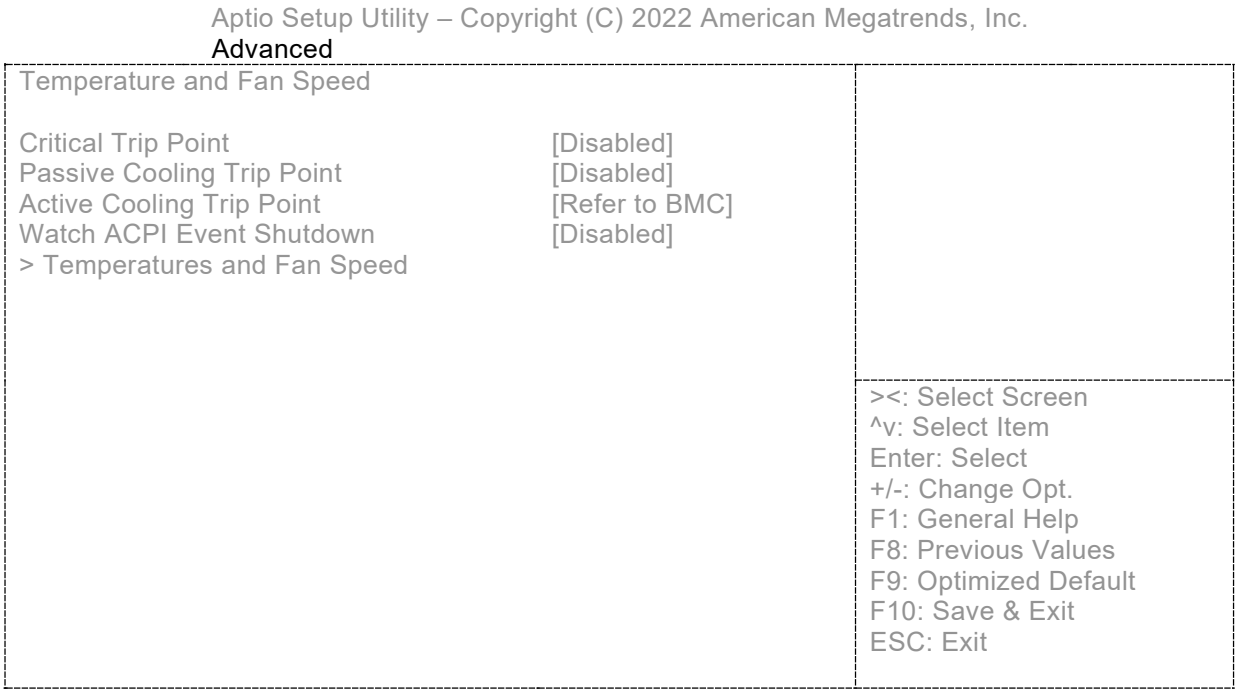
7.3.5.2 System Management > Flags



BIOS Item	Options	Description
Flags	**Info-only**	
Flags	**Read only**	Show current BMC settings.
BIOS Select	**Read only**	Display current boot BIOS ROM chip.
ATX/AT-Mode	**Read only**	Display current power mode setting, AT or ATX mode.

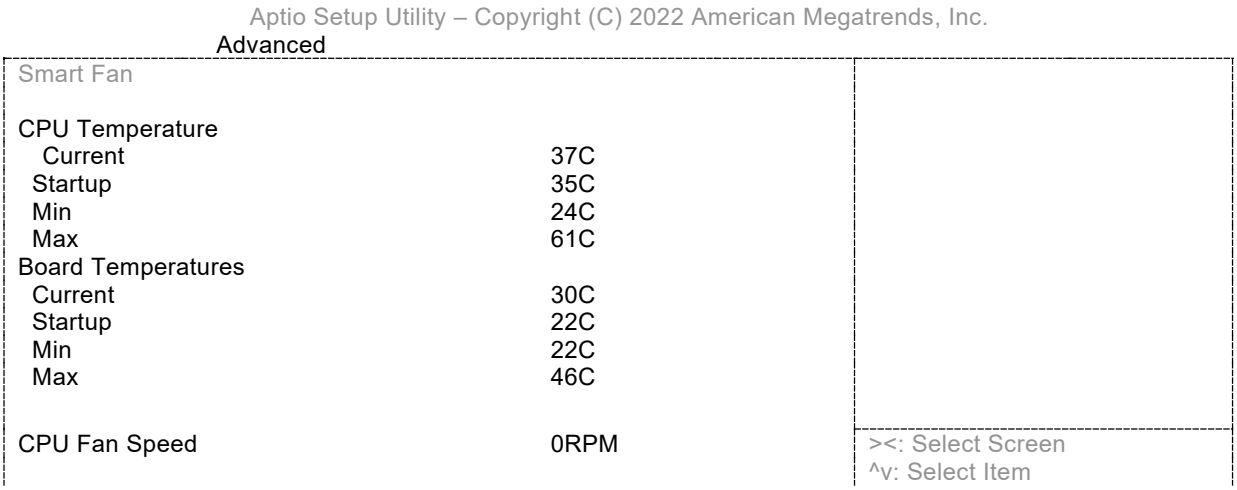
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7.3.6 Thermal Management



BIOS Item	Options	Description
Thermal Management	**Info-only**	
Critical Trip Point	**Disabled** 80 C 90 C 95 C	This value is the temperature threshold of the critical trip point.
Passive Cooling Trip Point	**Disabled** 70 C 80 C 90 C	This value is the temperature threshold of the passive cooling trip point.
Active Cooling Trip Point	40 C 50 C 60 C 70 C **Refer to BMC**	This value is the temperature threshold of the active cooling trip point.
Watch ACPI Event Shutdown	**Disabled** Enabled	Watchdog ACPI Event Shutdown Enabled/Disabled
Temperatures and Fan Speed	**Submenu**	Temperatures and Fan Speed

7.3.6.1 Thermal Management > Temperatures and Fan Speed

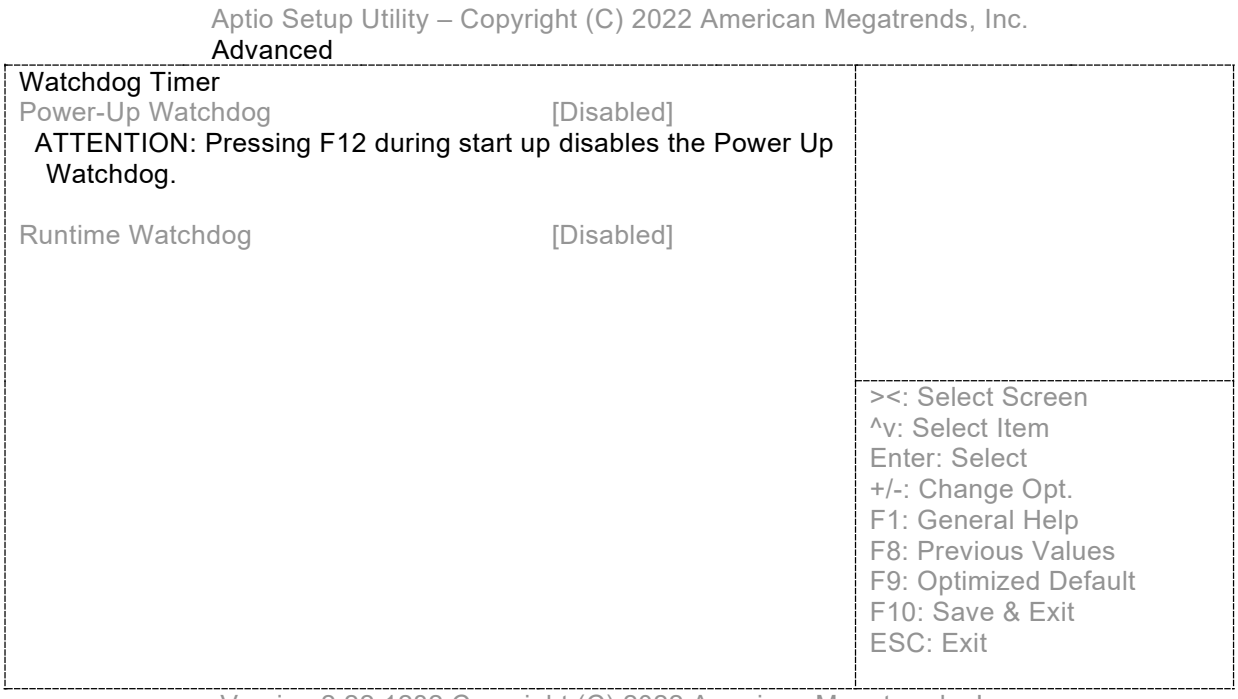


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BIOS Item	Options	Description
Temperatures and Fan Speed	**Info-only**	
CPU Temperatures	**Info-only**	
Current	**Read only**	Show current CPU temperature gotten from sensor.
Startup	**Read only**	Show the CPU temperature at system power up.
Min	**Read only**	Show the minimum CPU temperature after system boot.
Max	**Read only**	Show the maximum CPU temperature after system boot.
Board Temperatures	**Info-only**	
Current	**Read only**	Show current board temperature gotten from sensor.
Startup	**Read only**	Show the board temperature at system power up.
Min	**Read only**	Show the minimum board temperature after system boot.
Max	**Read only**	Show the maximum board temperature after system boot.
CPU Fan Speed	**Read only**	Show CPU fan operating speed (RPM).
Smart Fan	**Submenu**	

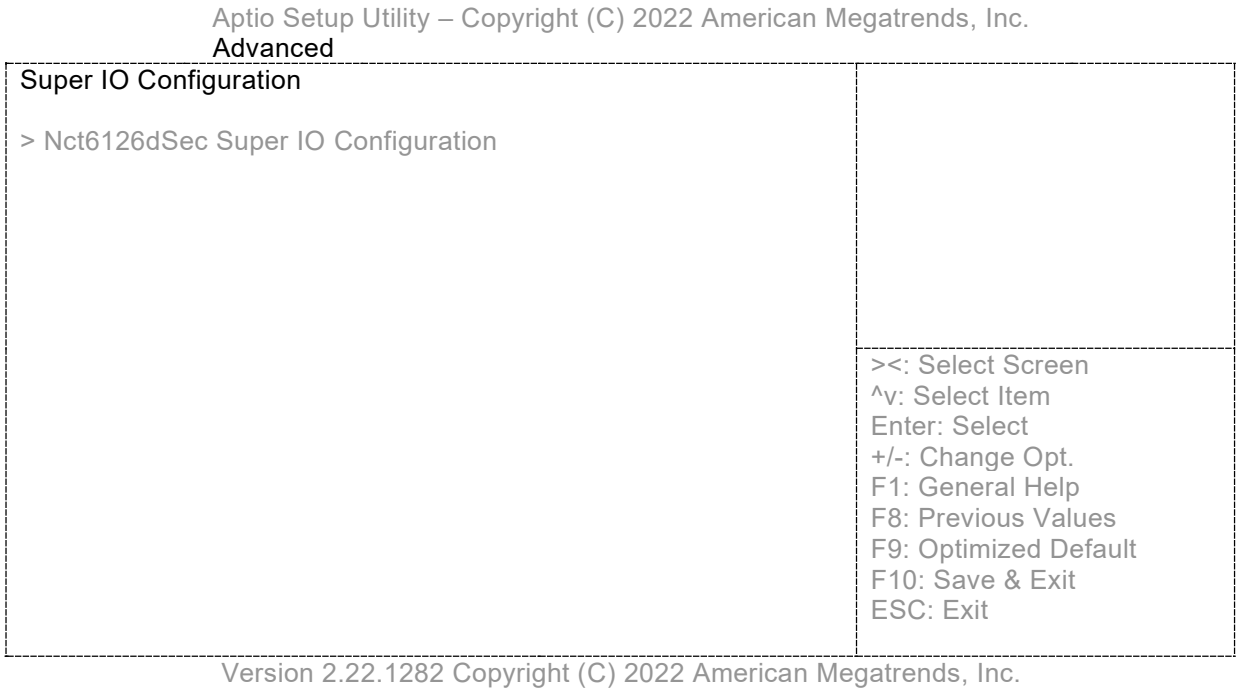
7.3.7 Watchdog Timer



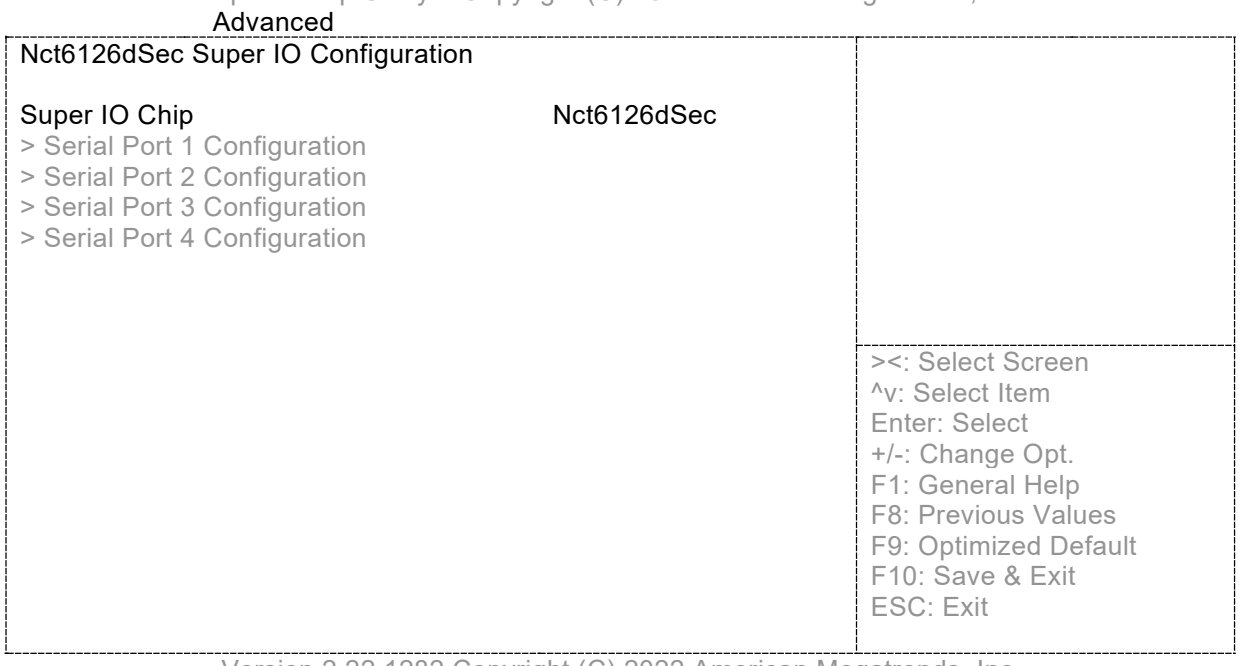
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BIOS Item	Options	Description
Watchdog Timer	**Info-only**	
Power-Up Watchdog	Enabled **Disabled**	The Power-Up Watchdog resets the system after a certain amount of time after power-up. Pressing F12 key during startup will disable the power-up watchdog timer.
RunTime Watchdog	Enabled **Disabled**	The RunTime Watchdog resets the system after a certain amount of time after power up.

7.3.8 Super IO Configuration

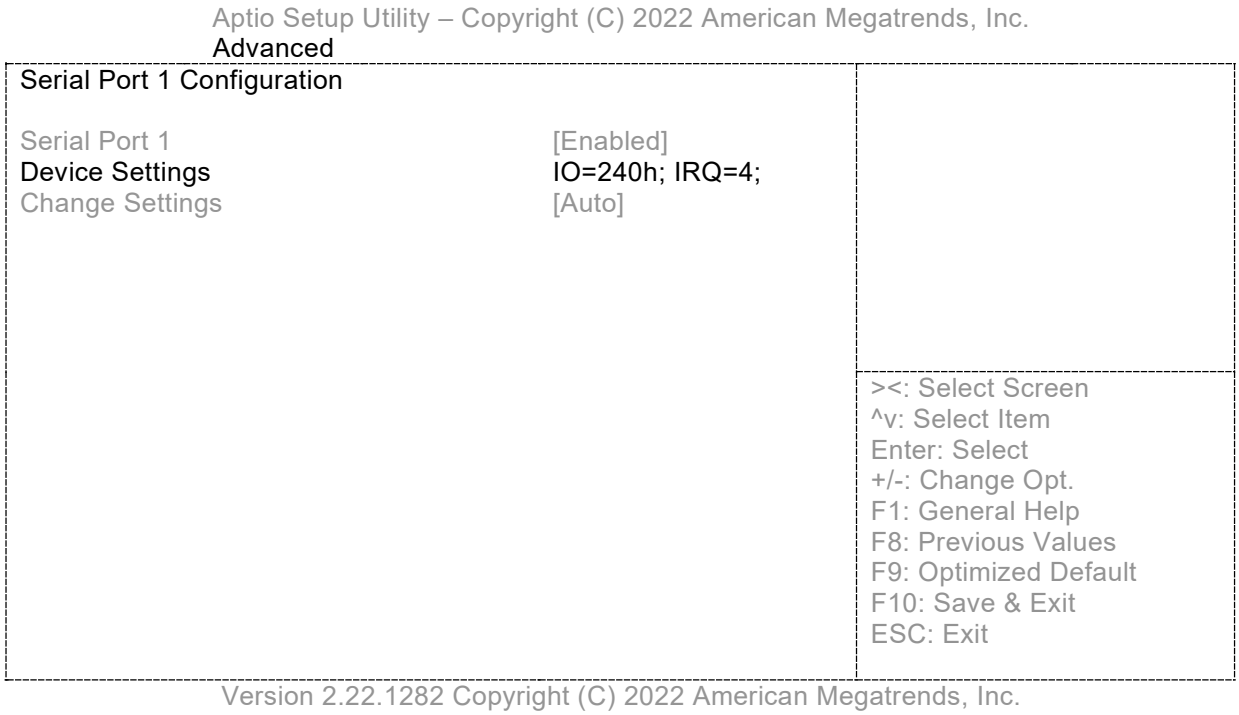


7.3.8.1 Super IO Configuration > Nct6126dSec Super IO Configuration



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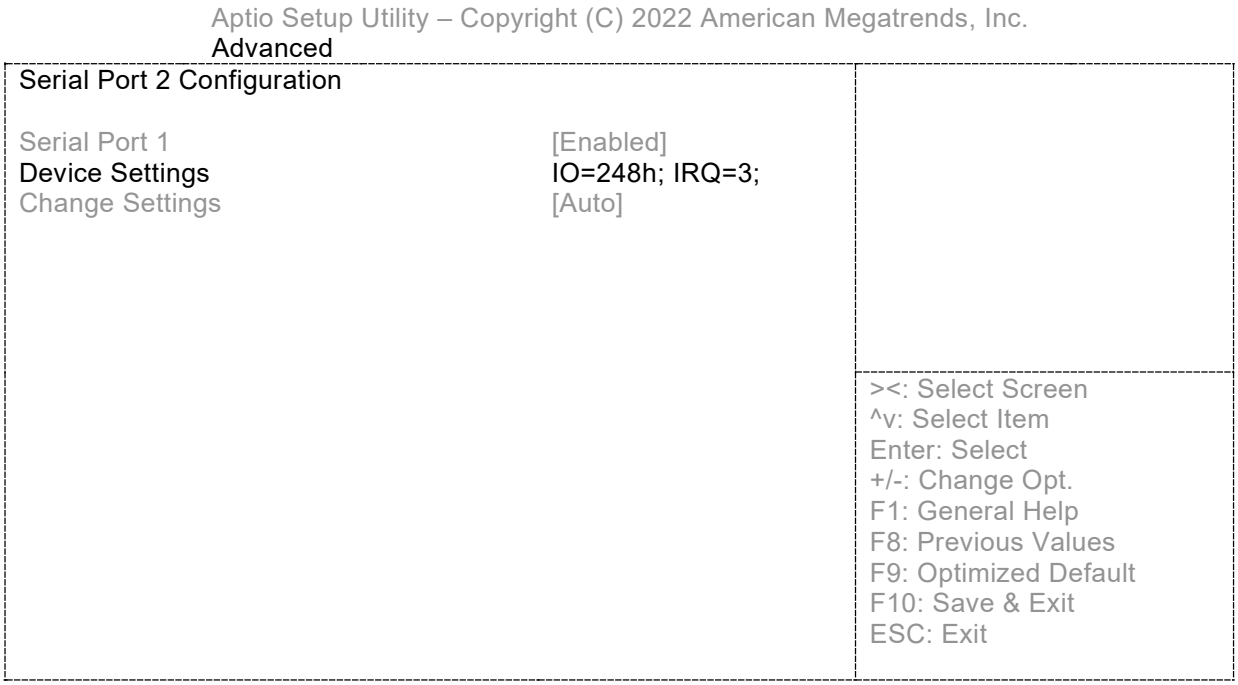
7.3.8.1.1 Super IO Configuration > Nct6126dSec Super IO Configuration > Serial Port 1 Configuration



BIOS Item	Options	Description
Serial Port 1	Disabled **Enabled**	Enable or disable serial port (COM).
Device Setting	**Info-only**	It will show current resource assignment of serial port (COM).
Change Settings	**Auto** IO=240;IRQ=4; IO=240;IRQ=3,4,5,6,7,10,11,12 IO=248;IRQ=3,4,5,6,7,10,11,12 IO=250;IRQ=3,4,5,6,7,10,11,12 IO=258;IRQ=3,4,5,6,7,10,11,12	Select an optimal setting for Super IO device.

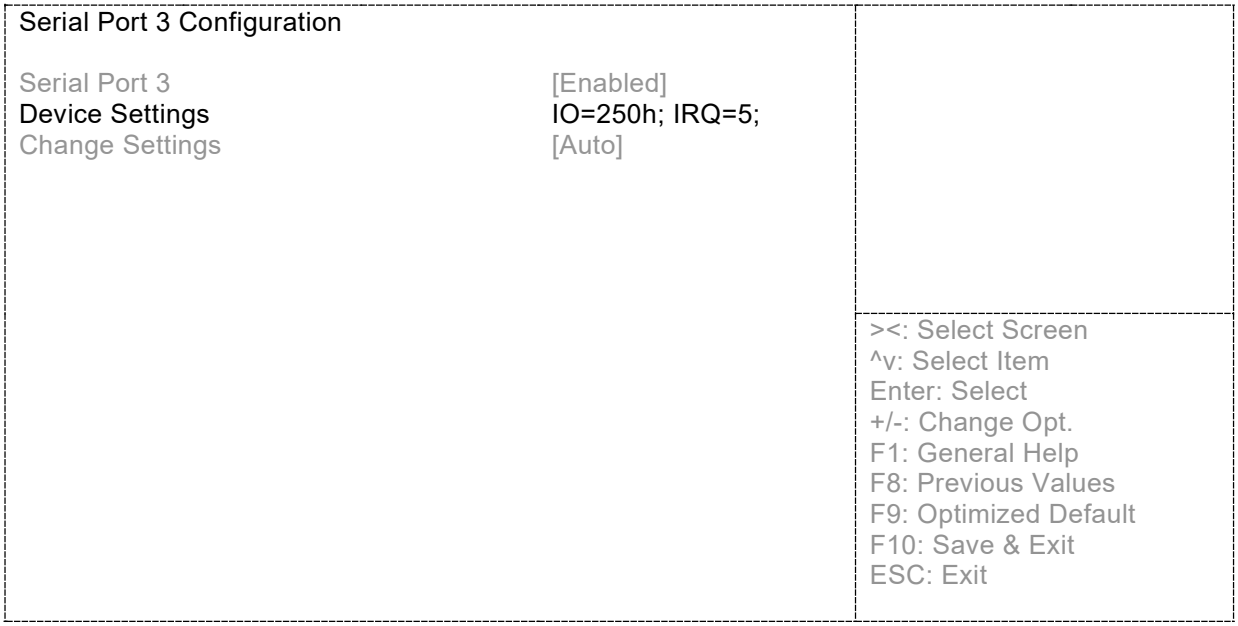
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7.3.8.1.2 Super IO Configuration > Nct6126dSec Super IO Configuration > Serial Port 2 Configuration



BIOS Item	Options	Description
Serial Port 2	Disabled **Enabled**	Enable or disable serial port (COM).
Device Setting	**Info-only**	It will show current resource assignment of serial port (COM).
Change Settings	**Auto** IO=248;IRQ=3; IO=240;IRQ=3,4,5,6,7,10,11,12 IO=248;IRQ=3,4,5,6,7,10,11,12 IO=250;IRQ=3,4,5,6,7,10,11,12 IO=258;IRQ=3,4,5,6,7,10,11,12	Select an optimal setting for Super IO device.

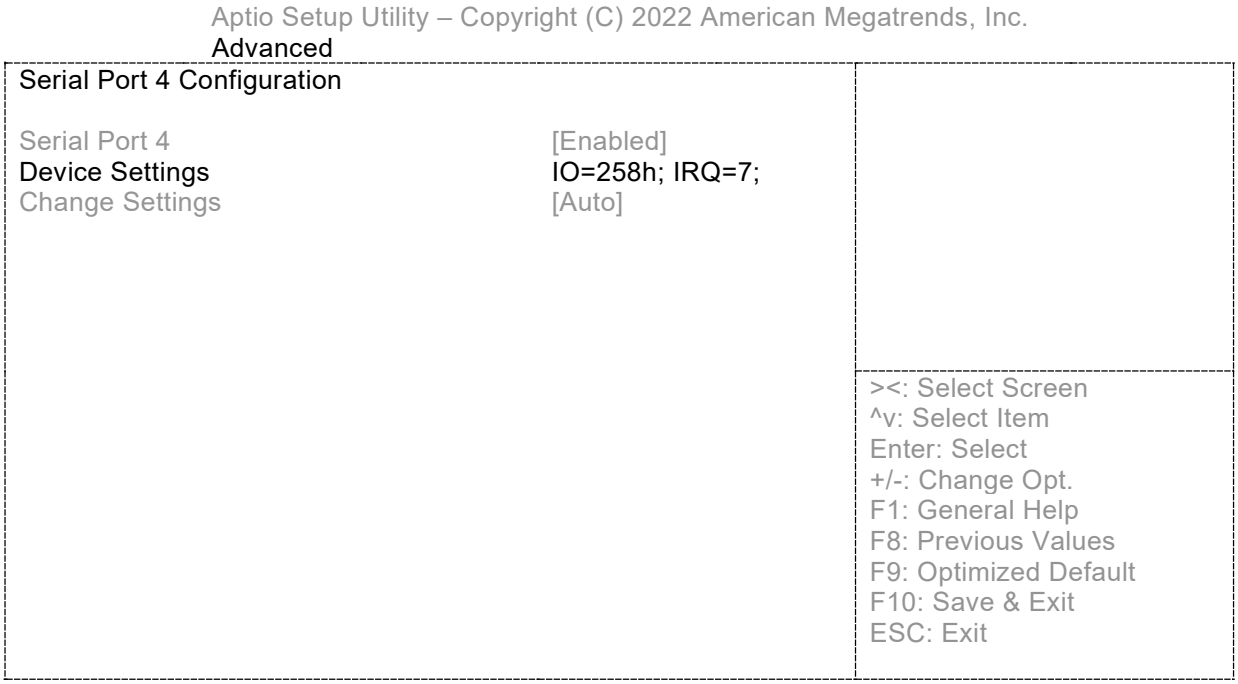
7.3.8.1.3 Super IO Configuration → Nct6126dSec Super IO Configuration → Serial Port 3 Configuration



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BIOS Item	Options	Description
Serial Port 3	Disabled **Enabled**	Enable or disable serial port (COM).
Device Setting	**Info-only**	It will show current resource assignment of serial port (COM).
Change Settings	**Auto** IO=250;IRQ=5; IO=240;IRQ=3,4,5,6,7,10,11,12 IO=248;IRQ=3,4,5,6,7,10,11,12 IO=250;IRQ=3,4,5,6,7,10,11,12 IO=258;IRQ=3,4,5,6,7,10,11,12	Select an optimal setting for Super IO device.

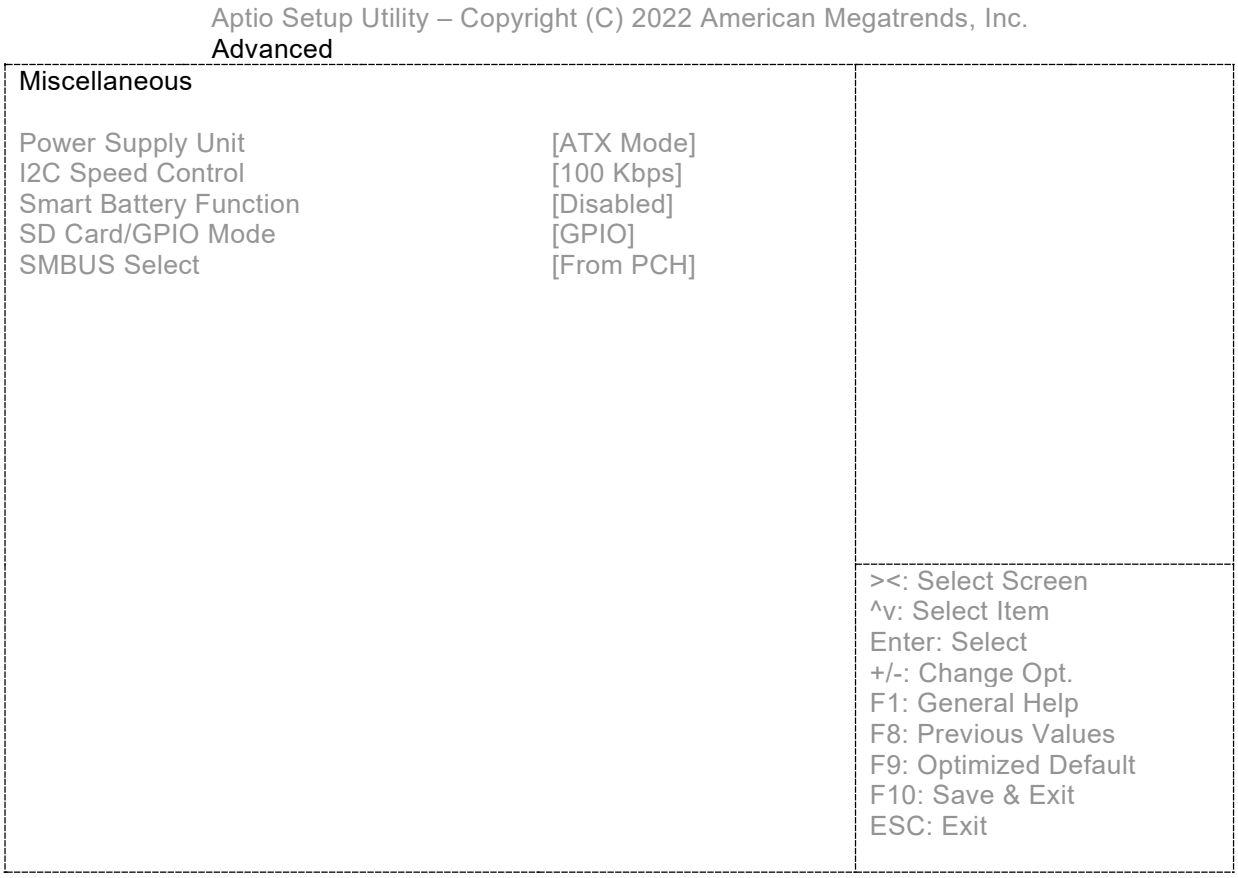
7.3.8.1.4 Submenu: Super IO Configuration > Nct6126dSec Super IO Configuration > Serial Port 4 Configuration



BIOS Item	Options	Description
Serial Port 4	Disabled **Enabled**	Enable or disable serial port (COM).
Device Setting	**Info-only**	It will show current resource assignment of serial port (COM).
Change Settings	**Auto** IO=258;IRQ=7; IO=240;IRQ=3,4,5,6,7,10,11,12 IO=248;IRQ=3,4,5,6,7,10,11,12 IO=250;IRQ=3,4,5,6,7,10,11,12 IO=258;IRQ=3,4,5,6,7,10,11,12	Select an optimal setting for Super IO device.

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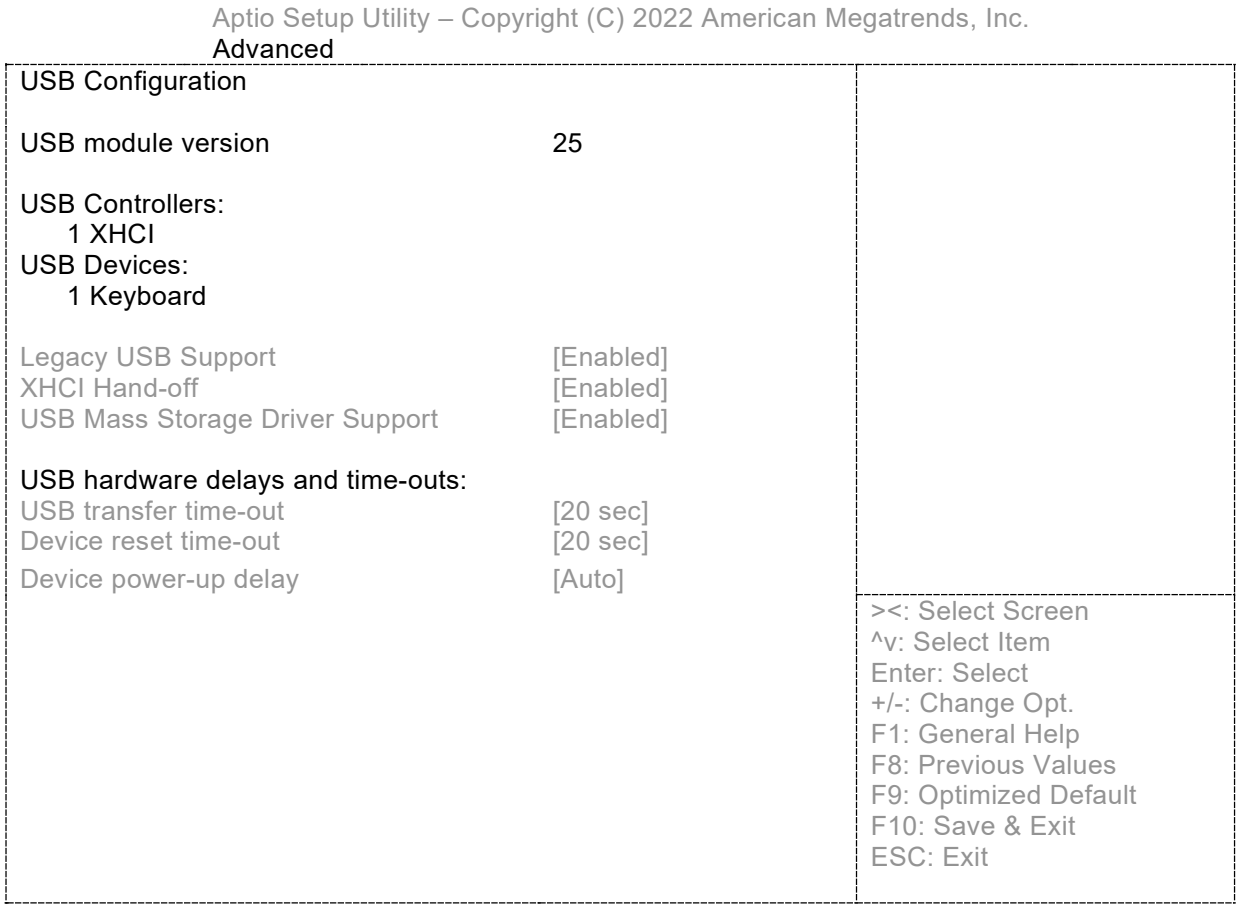
7.3.9 Miscellaneous



BIOS Item	Options	Description
Power Supply Unit	Emulate AT mode **ATX Mode**	Select Emulation AT or ATX function. If this option set to [Emulation AT], BIOS will report no suspend functions (S3 & S4) to ACPI OS. In windows XP, it will make OS show shutdown message during system shutdown. ATX: OS will turn off system power when shutdown.
I2C Speed Control	**100 Kbps** 400 Kbps	I2C Speed Control
Smart Battery Function	**Disabled** Enabled Auto	Enable/Disable Smart Battery function. Auto: disable Smart Battery function if charger IC not be detected.
SD Card/GPIO Mode	**GPIO** SD Card	Select SD Card or GPIO
SMBUS Select	**From PCH** From EC	Select SMBUS Routine

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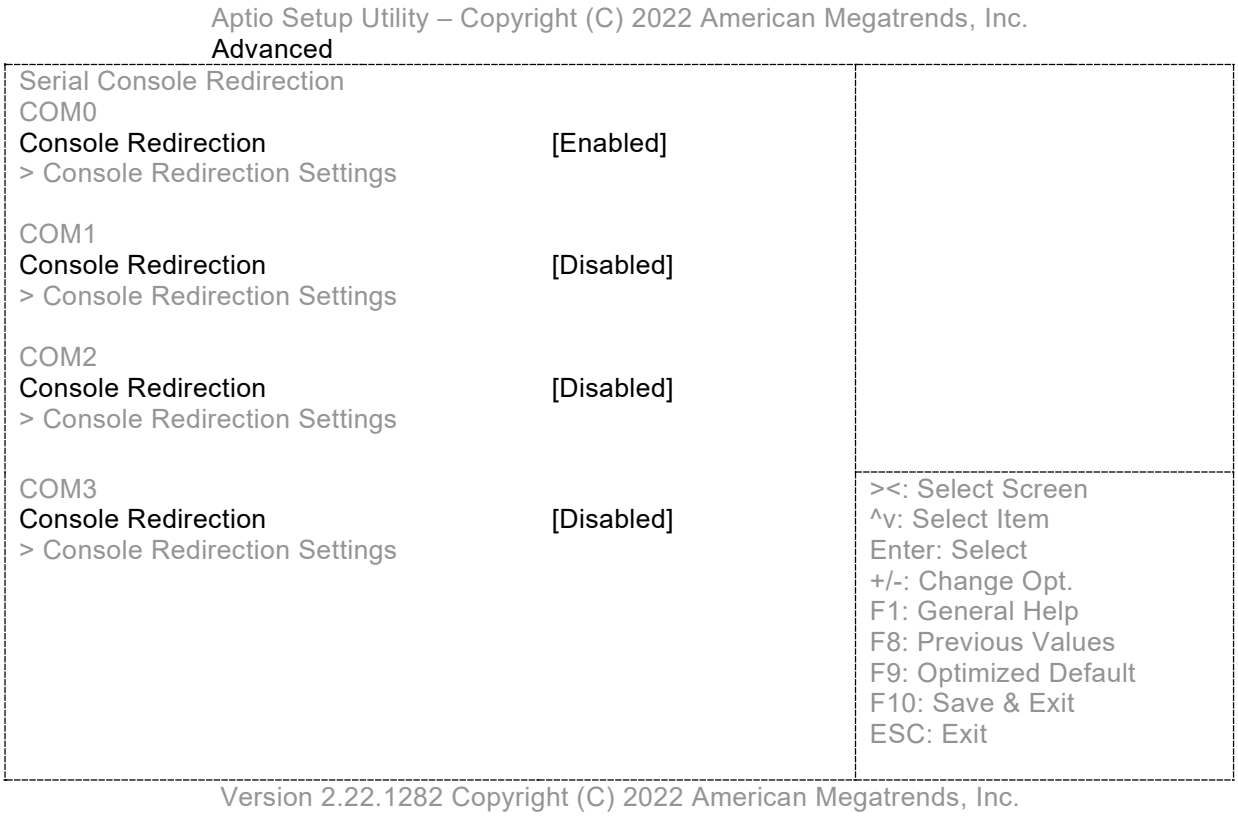
7.3.10 USB Configuration



BIOS Item	Options	Description
USB module version	**Info-only**	
USB Controllers	**Info-only**	
USB Devices	**Info-only**	
Legacy USB Support	**Enabled** Disabled Auto	Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications.
XHCI Hand-off	**Enabled** Disabled	This is a workaround for OSes without XHCI hand-off support.The XHCI ownership change should be claimed by XHCI driver.
USB Mass Storage Driver Support	Disabled **Enabled**	Enable/Disable USB Mass Storage Driver Support.
USB transfer time-out	1 sec 5 sec 10 sec **20 sec**	The time-out value for Control, Bulk, and Interrupt transfers.
Device reset time-out	10 sec **20 sec** 30 sec 40 sec	USB mass storage device Start Unit command time-out.
Device power-up delay	**Auto** Manual	Maximum time the device will take before it properly reports itself to the Host Controller. ‘Auto’ uses default value: for a Root port it is 100 ms, for a Hub port the delay is taken form Hub descriptor.

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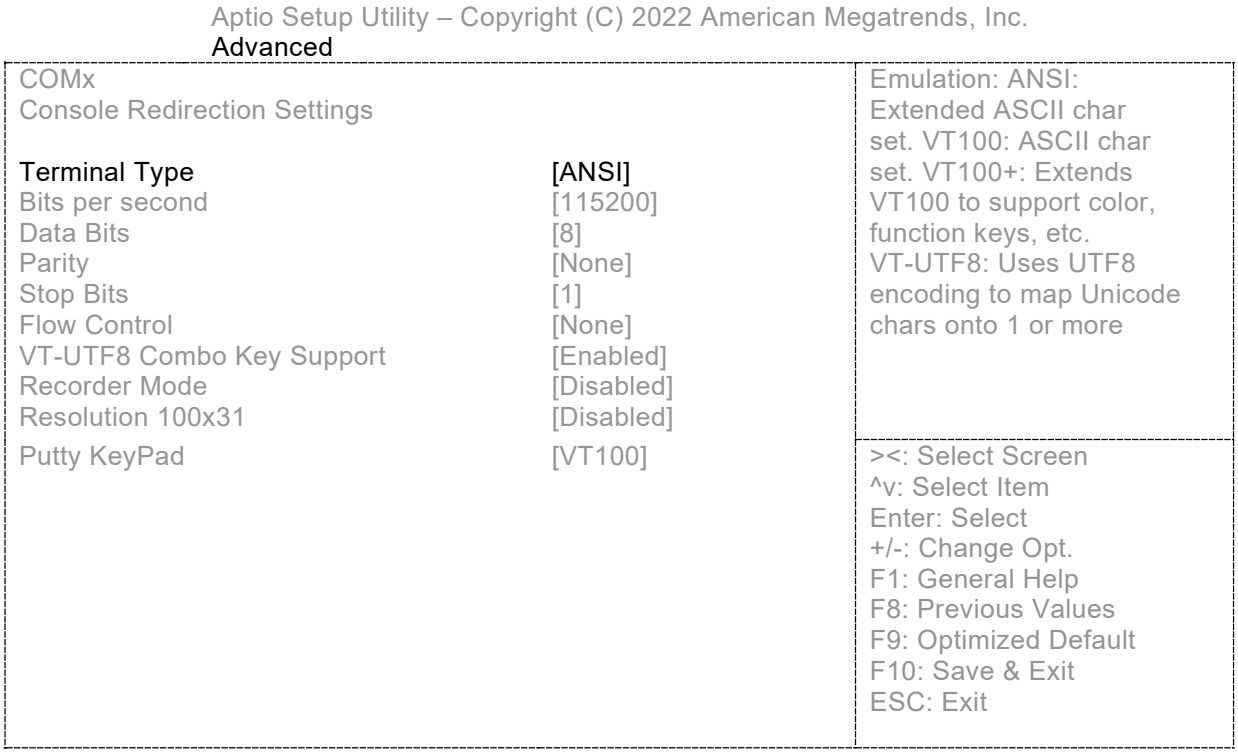
7.3.11 Serial Console Redirection



BIOS Item	Options	Description
Console Redirection	**Disabled** Enabled	To enable or disable console redirection of COMx.
Console Redirection Settings	**Submenu**	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.

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7.3.11.1 Serial Console Redirection > Console Redirection Settings

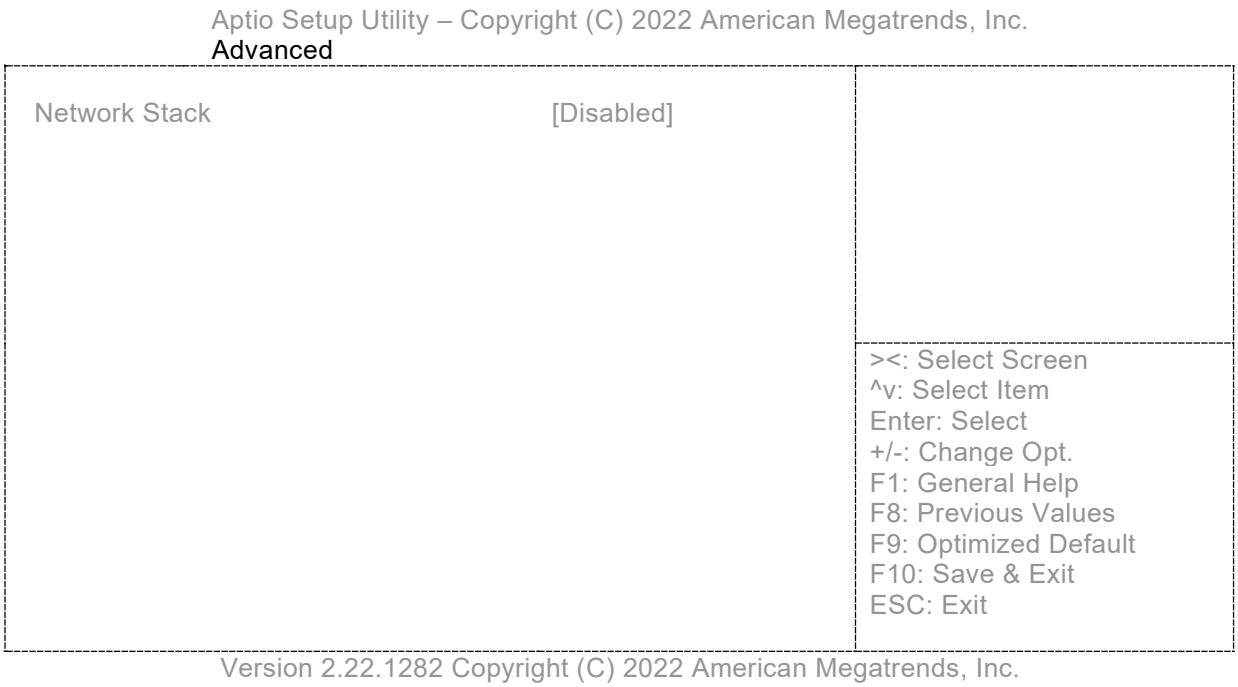


BIOS Item	Options	Description
Terminal Type	**VT100** VT100+ VT-UTF8 ANSI	Configure the type of console emulation. Emulation: **ANSI:** Extended ASCII char set. **VT100:** ASCII char set. **VT100+:** Extends VT100 to support color, function keys, etc. **VT-UTF8:** Uses UTF8 encoding to map Unicode chars onto 1 or more bytes.
Bits per second	9600 19200 38400 57600 **115200**	Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speed.
Data Bits	7 **8**	Configure the number of data bits in each transmitted or received serial character for both serial ports.
Parity	**None** Even Odd	Configures if parity bit is generated (transmit data) or checked. A parity bit can be sent with the data bits to detect some transmission errors. Even: parity bit is 0 if the num of 1's in the data bits is even. Odd: parity bit is 0 if num of 1's in the data bits is odd. Mark: parity bit is always 1. Space: Parity bit is always 0. Mark and Space Parity do not allow for error detection. They can be used as an additional data bit.
Stop Bits	**1** 2	Configures the number of stop bits transmitted and received in each serial character for both serial ports. Stop bits indicate the end of a serial data packet. (A start bit indicates the beginning). The standard setting is 1 stop bit. Communication with slow devices may require more than 1 stop bit.
Flow Control	**None** Hardware Software	Configures flow control for console redirection. Hardware flow control uses RTC/CTS. Software flow control uses XON/XOFF.
VT-UTF8 Combo Key Support	Disabled **Enabled**	Enable VT-UTF8 combination key support for ANSI/VT100 terminals.

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Recorder Mode	**Disabled** Enabled	With this mode enabled only text will be sent. This is to capture terminal data.
Resolution 100x31	**Disabled** Enabled	Enables or disables extended terminal resolution.
Putty KeyPad	**VT100** LINUX XTERMR6 SCO ESCN VT400	Select Function Keys and Key Pad on Putty.

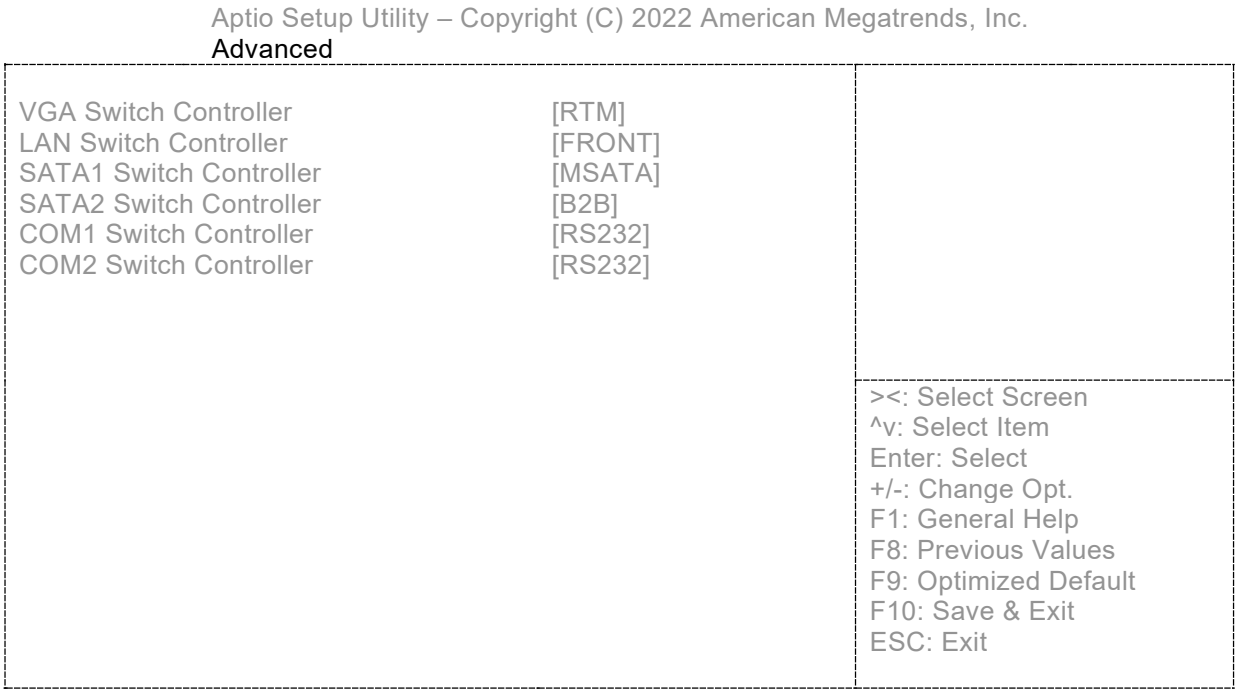
7.3.12 Network Stack Configuration



BIOS Item	Options	Description
Network Stack	**Disabled** Enabled	Enable/Disable UEFI Network Stack

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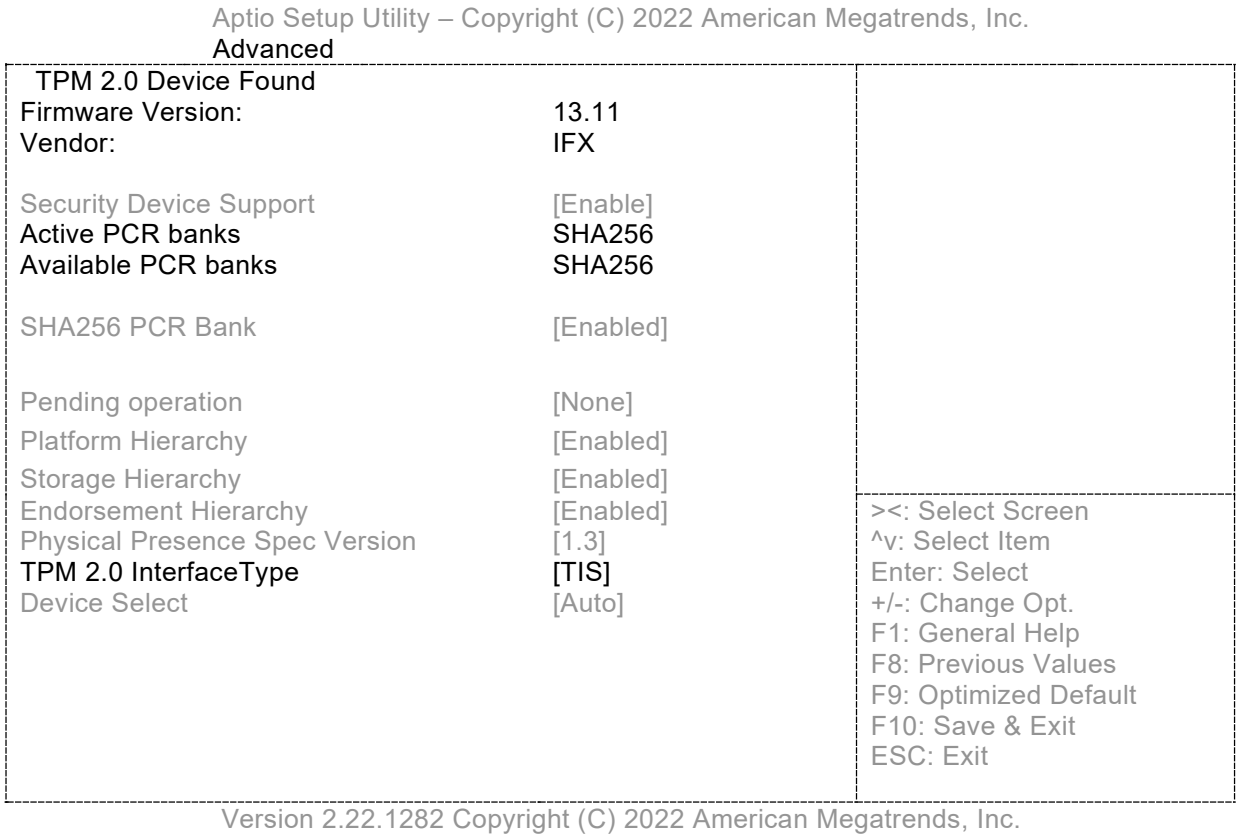
7.3.13 Function Switch Configuration



BIOS Item	Options	Description
VGA Switch Controller	**[RTM]** [FRONT]	Select which VGA port to output the image.
LAN Switch Controller	**[FRONT]** [RTM]	Select which LAN port to use.
SATA1 Switch Controller	[B2B] **[MSATA]**	Select which function for SATA1 port.
SATA2 Switch Controller	**[B2B]** [RTM]	Select which function for SATA2 port.
COM1 Switch Controller	**[RS232]** [RS485] [RS422]	Select which function for COM1 port.
COM2 Switch Controller	**[RS232]** [RS485] [RS422]	Select which function for COM2 port.

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7.3.14 Trusted Computing

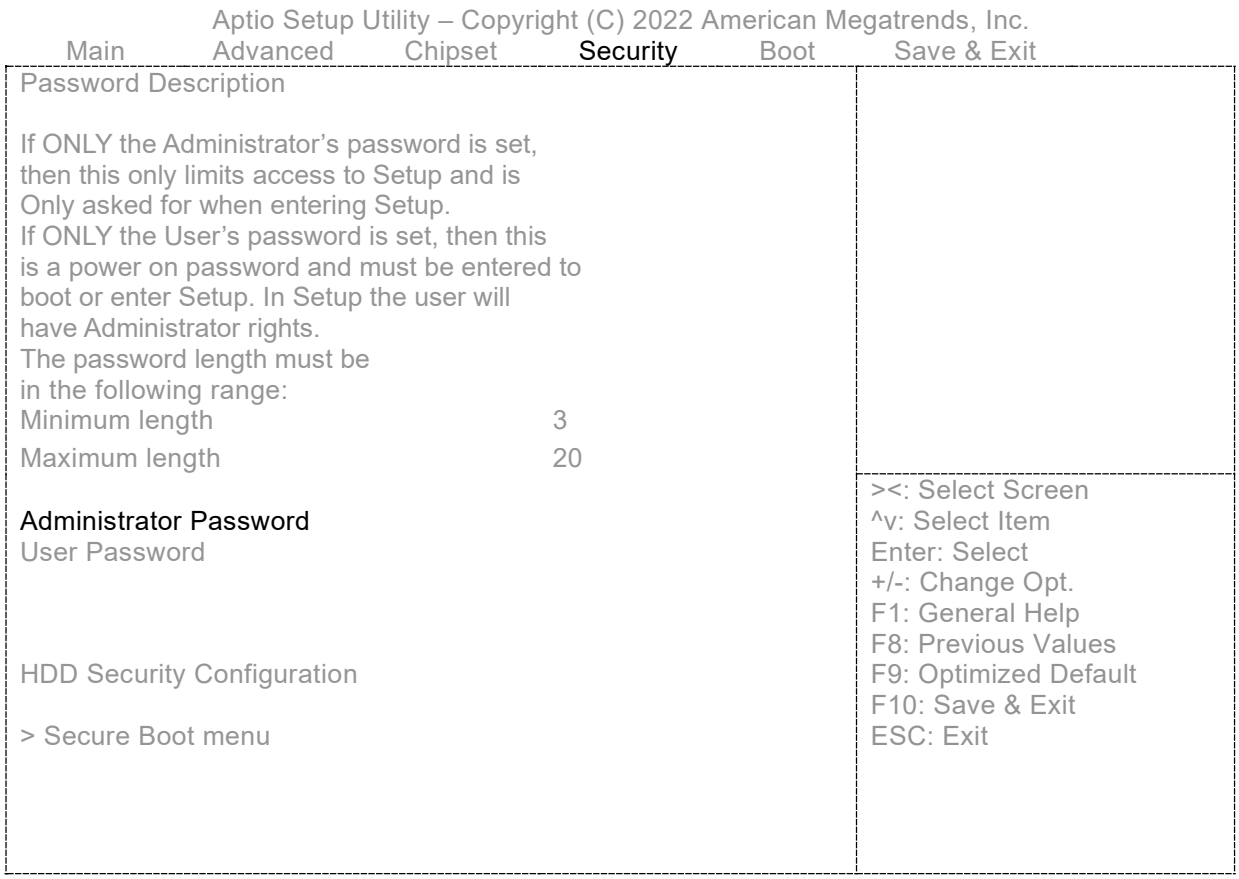


BIOS Item	Options	Description
Firmware Version:	**Info-only**	
Vendor:	**Info-only**	
Security Device Support	[Disable] **[Enable]**	Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.
Active PCR banks	**Info-only**	
Available PCR banks	**Info-only**	
SHA256 PCR Bank	[Disabled] **[Enabled]**	Enable or Disable SHA256 PCR Bank
Pending operation	**[None]** [TPM Clear]	Schedule an Operation for the Security Device. NOTE: Your Computer will reboot during restart in order to change State of Security Device.
Platform Hierarchy	[Disabled] **[Enabled]**	Enable or Disable Platform Hierarchy
Storage Hierarchy	[Disabled] **[Enabled]**	Enable or Disable Storage Hierarchy
Endorsement Hierarchy	[Disabled] **[Enabled]**	Enable or Disable Endorsement Hierarchy
Physical Presence Spec Version	[1.2] **[1.3]**	Select to Tell O.S. to support PPI Spec Version 1.2 or 1.3. Note some HCK tests might not support 1.3.
TPM 2.0 InterfaceType	**Info-only**	
Device Select	[TPM 1.2] [TPM 2.0] **[Auto]**	TPM 1.2 will restrict support to TPM 1.2 devices, TPM 2.0 will restrict support to TPM 2.0 devices, Auto will support both with the default set to TPM 2.0 devices if not found, TPM 1.2 devices will be enumerated

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7.4 Security Menu

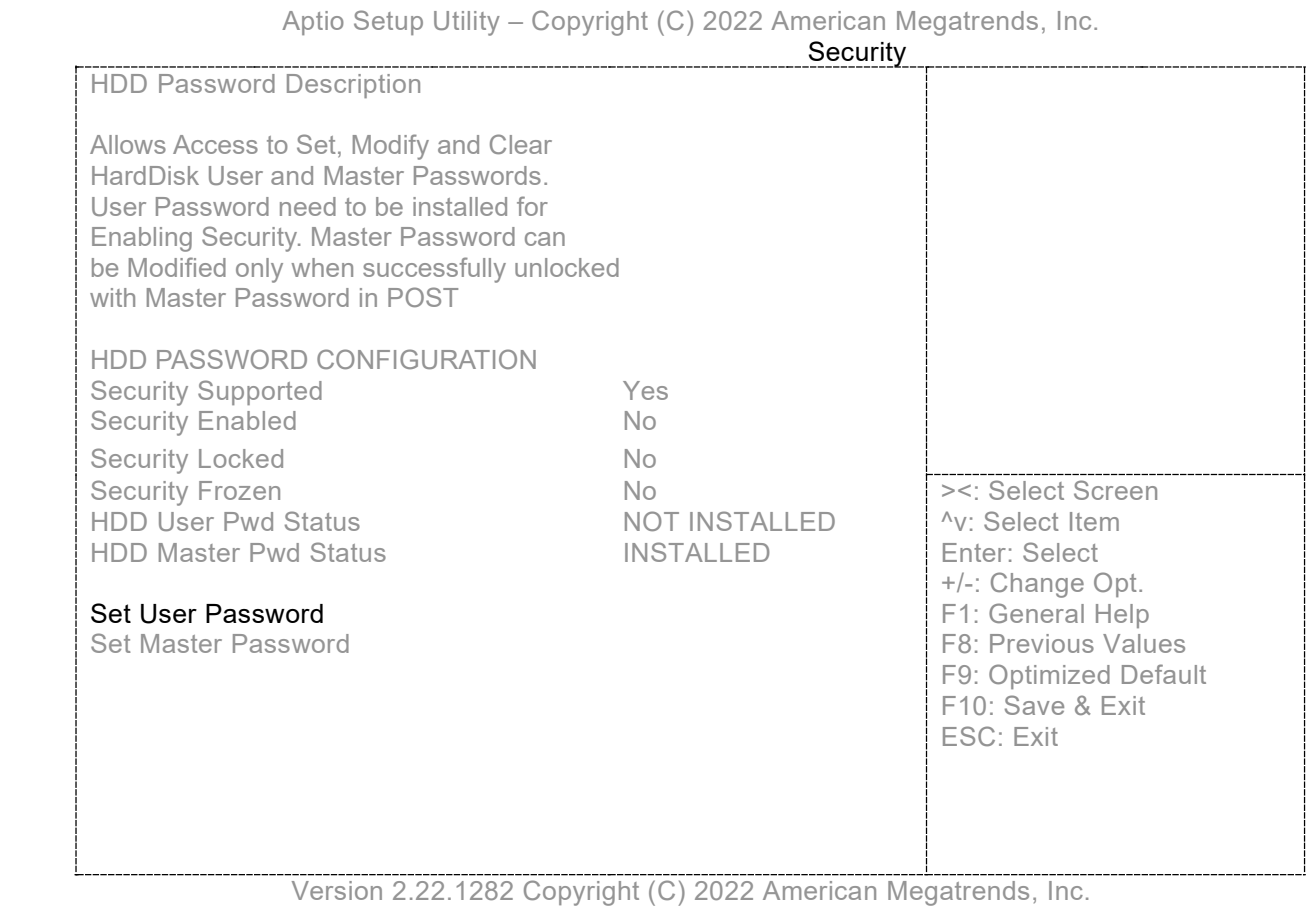
This menu contains the settings for security in the system.



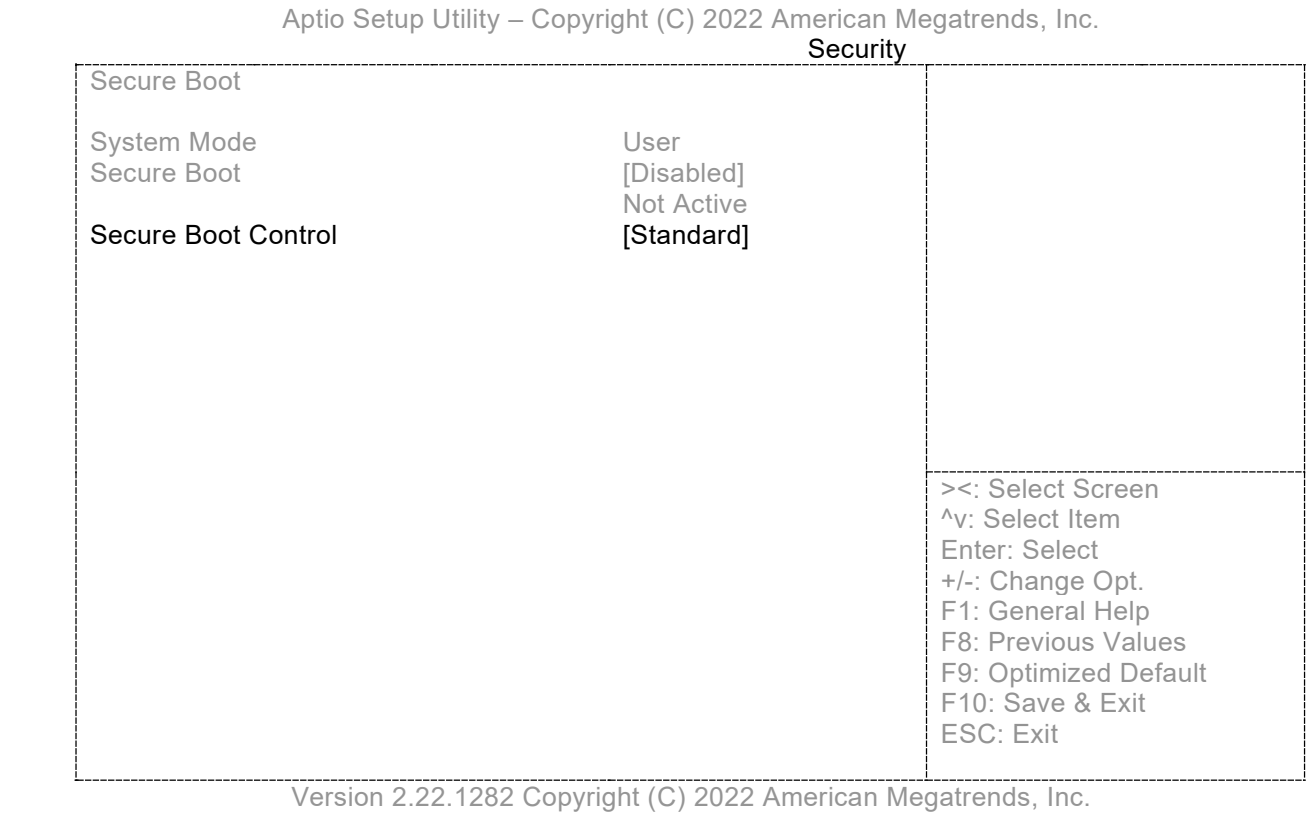
BIOS Item	Options	Description
Administrator Password	**Enter to set password**	Configure/Clear Administrator Password. When pressing enter, a menu will be popped up for creating new password. When password installed, press enter without inputting password, it will clear password.
User Password	**Enter to set password**	Configure/Clear User Password. When pressing enter, a menu will be popped up for creating new password. When password installed, press enter without inputting password, it will clear password.
Secure Boot menu	**Submenu**	

When selecting a HDD to configure passwords, BIOS will enter another new BIOS setup page like below. The method of configuring HDD password is the same as BIOS passwords. Once password is set, it will reflect the status on the screen, like 'INSTALLED' change on 'HDD User Pwd Status'. When there is no HDD user password installed, you can always change master password without confirming the latest installed password. Once HDD user password is installed, HDD master password is not allowed changing.

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7.4.1 Secure Boot

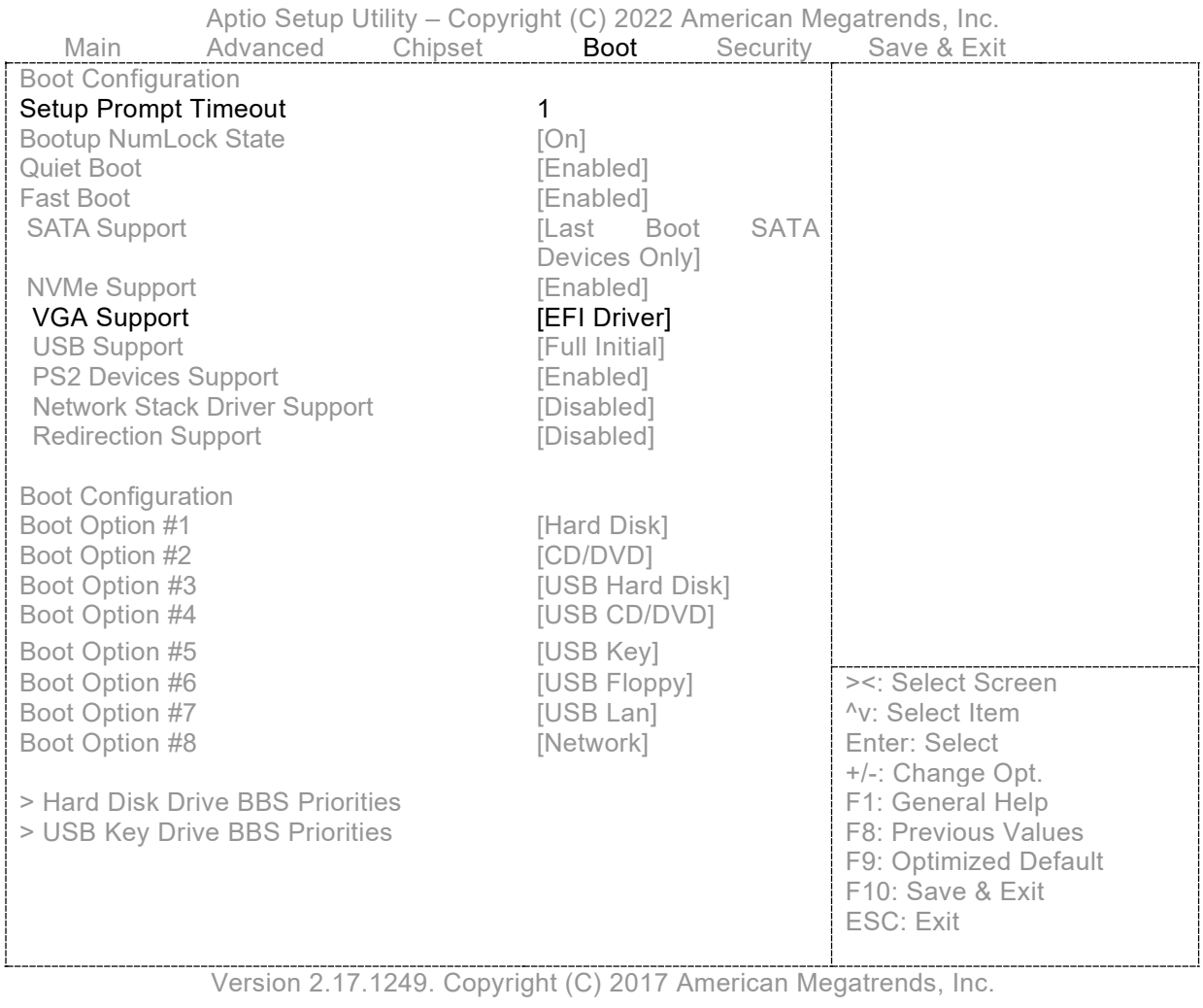


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BIOS Item	Options	Description
System Mode	**Info-only**	
Secure Boot	**Disabled** Enabled	Secure Boot feature is Active if Secure Boot is Enabled, Platform Key(PK) is enrolled and the System is in user mode. The mode change requires platform reset.
Secure Boot Control	**Standard** Custom	Secure Boot mode options: Standard or Custom. In Custom mode, Secure Boot Policy variables can be configured by a physically present user without full authentication.

7.5 Boot Menu

This menu contains the settings for bootable devices in the system.

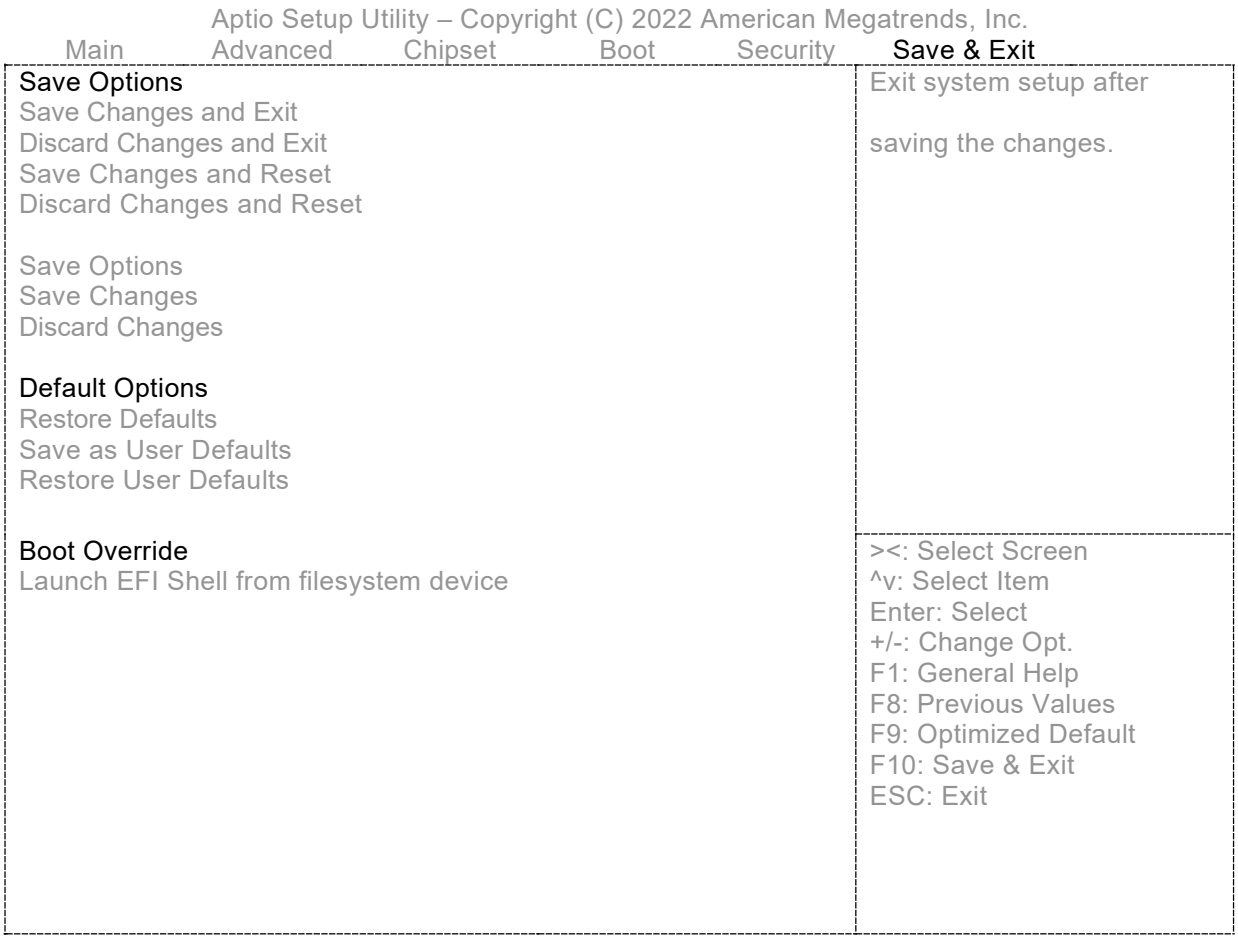


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BIOS Item	Options	Description
Setup Prompt Timeout	**1**	Number of seconds to wait for setup activation key. 65535 (0xFFFF) means indefinite waiting.
Bootup NumLock State	On **Off**	Select the keyboard NumLock state after system boot.
Quiet Boot	Disabled **Enabled**	**Enabled:** will show splash screen during POST. **Disabled:** will show boot message during POST.
Fast Boot	Disabled **Enabled**	Enable or disabled Fast boot feature. Most probes are skipped to reduce time cost during boot.
SATA Support	**Last Boot SATA Devices Only** All SATA Devices	If Last Boot SATA Devices Only, Only last boot SATA device will be available in Post. If All SATA Devices, All SATA devices will be available in OS and Post.
NVMe Support	Disabled **Enabled**	If Disabled, NVMe device will be skipped.
VGA Support	**Info-only**	
USB Support	Disabled **Full Initial** Partial Initial	If Disabled, all USB devices will NOT be available until after OS boot. If Partial Initial, USB Mass Storage and specific USB port/device will NOT be available before OS boot. If Enabled, all USB devices will be available in OS and Post.
PS2 Devices Suppot	Disabled **Enabled**	If Disabled, PS2 devices will be skipped.
Network Stack Driver Support	**Disabled** Enabled	If Disabled, Network Stack Driver will be skipped.
Redirection Support	**Disabled** Enabled	If disable, Redirection function will be disabled.
Boot Option #1~#11	Hard Disk NVMe UEFI AP:UEFI:Built-in EFI Shell CD/DVD SD USB Hard Disk USB CD/DVD USB Key USB Floppy UAB Lan Network	Set system boot order.

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7.6 Save & Exit Menu



BIOS Item	Options	Description
Save Changes and Exit	**Enter**	Save changed settings and exit BIOS setup utility.
Discard Changes and Exit	**Enter**	Skip changed setting and exit BIOS setup utility.
Save Changes and Reset	**Enter**	Save all changed settings and let system do reset to boot system.
Discard Changes and Reset	**Enter**	Discard all changed settings and let system do reset to boot system.
Save Changes	**Enter**	Save all changed settings.
Discard Changes	**Enter**	Discard changes done so far to any of the setup options.
Restore Default	**Enter**	Load the default made when BIOS was built.
Save as User Default	**Enter**	Save all changed done so far as User Defaults.
Restore User Default	**Enter**	Load the default that user save as user defaults.
Boot Override	**Info-only**	

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Safety Instructions

For user safety, please read and follow all instructions, WARNINGS, CAUTIONS, and NOTES marked in this manual and on the associated equipment before handling/operating the equipment.

- Read these safety instructions carefully.
- Keep this user’ s manual for future reference.
- Read the specifications section of this manual for detailed information on the operating environment of this equipment.
- When installing/mounting or uninstalling/removing equipment:
  - Turn off power and unplug any power cords/cables.
- To avoid electrical shock and/or damage to equipment:
  - Keep equipment away from water or liquid sources;
  - Keep equipment away from high heat or high humidity;
  - Keep equipment properly ventilated (do not block or cover ventilation openings);
  - Make sure to use recommended voltage and power source settings;
  - Always install and operate equipment near an easily accessible electrical socket-outlet;
  - Secure the power cord (do not place any object on/over the power cord);
  - Only install/attach and operate equipment on stable surfaces and/or recommended mountings; and,
  - If the equipment will not be used for long periods of time, turn off and unplug the equipment from its power source.
- Never attempt to fix the equipment. Equipment should only be serviced by qualified personnel.

A Lithium-type battery may be provided for uninterrupted, backup or emergency power.



WARNING:

Risk of explosion if battery is replaced with one of an incorrect type. Dispose of used batteries appropriately.

- Equipment must be serviced by authorized technicians when:
  - The power cord or plug is damaged;
  - Liquid has penetrated the equipment;
  - It has been exposed to high humidity/moisture;
  - It is not functioning or does not function according to the user’ s manual;
  - It has been dropped and/or damaged; and/or,
  - It has an obvious sign of breakage.

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Getting Services

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