



GV-Z390 User Manual

Issue 1.1

www.CoreIPC.com

Security Guidance

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- To help you use the CoreIPC motherboard, please read the [User Manual] carefully.
- For product-related information, please be sure to read these safety instructions carefully.
- Identifying the Product Version
You can find the version of this motherboard labeled [Issue:X.X] on the motherboard itself. X.X represents a number; for example, a label reading [Issue1.0] indicates that the version of this motherboard is 1.0. Please note the product version when updating the motherboard's BIOS or drivers, or when referring to other technical documentation.

Basic Safety Tips

1. Before using this product, please be sure to read the product manual carefully.
2. Any cards not yet ready for installation should be stored in anti-static bags.
3. Before removing the board from the antistatic bag, place your hand on a grounded metal object for a moment (such as 10 seconds) to discharge any static electricity from your body and hands.
4. When handling circuit boards, you must wear anti-static gloves and make it a habit to touch only the edges.
5. To prevent electric shock or damage to the product, be sure to turn off the AC power before inserting, removing, or reconfiguring the board.
6. Before moving a board or the entire unit, you must first turn off the AC power.
7. For complete systems, be sure to turn off the AC power before adding or removing any boards.
8. Before connecting or disconnecting any device, you must first turn off the AC power.
9. To avoid unnecessary damage to the product caused by frequent power cycles, wait at least 30 seconds after turning it off before turning it back on.

Ordering Information

No.	Model	Chipset	DDR	HDMI	VGA	LVDS	LAN	USB	PS2	LPT	COM/ 485	POWER
1	GV-Z390 VER1.1	Z390/B360/Q370	DDR4	1	1	1	5	9	0	0	4/2	9-36V

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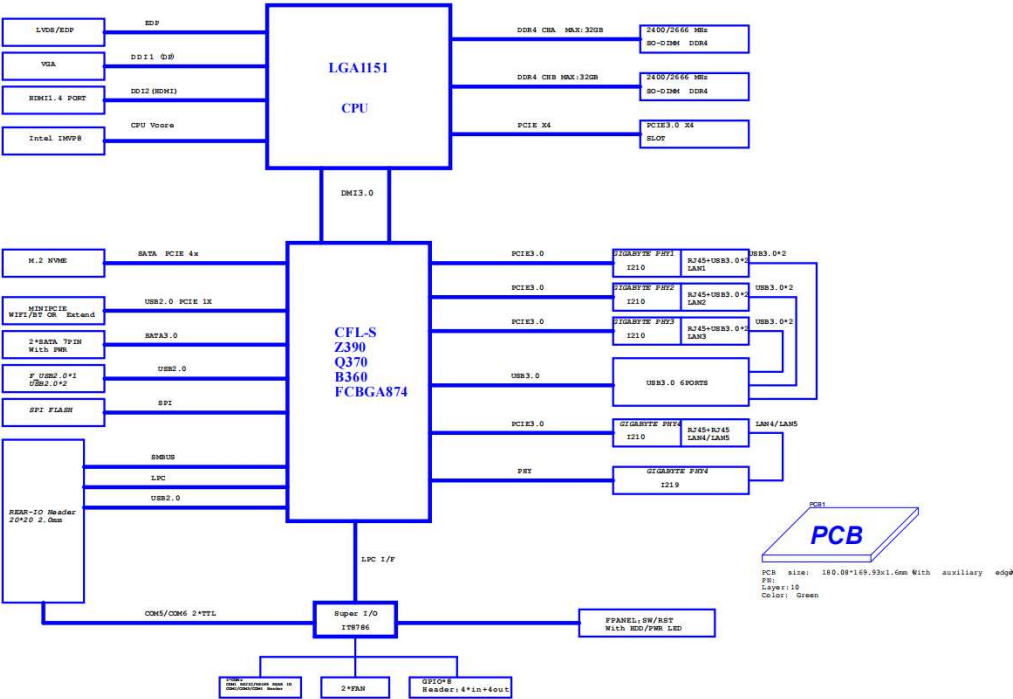
1. Product Description

GV-Z390 is a CoreIPC Mini-ITX machine vision motherboard supporting 6th, 8th, and 9th generation LGA1151 Intel® Celeron®, Pentium®, and Core™ i3/i5/i7 processors.

The main features of the motherboard are as follows:

- Supports 6th, 8th, and 9th generation LGA1151 Intel® Celeron®, Pentium®, and Core™ i3/i5/i7 processors;
- Supports two SO-DIMM slots for DDR4-2666, 1.2 V memory, up to 64 GB;
- Supports VGA, HDMI, LVDS, or eDP display output;
- Supports four Intel® I210 Gigabit Ethernet ports and one Intel® I219 Gigabit Ethernet port;
- Supports one M.2 Key M slot with automatic SATA/NVMe support;
- Supports one Mini PCIe slot for Wi-Fi/Bluetooth;
- Supports six USB 3.0 ports and three USB 2.0 ports;
- Supports six serial ports, including two TTL ports, with optional support for two RS485 ports;
- Provides one onboard PCIe 3.0 x4 slot;
- Supports one 40-pin multifunction expansion header;
- Supports a wide-range 9-36 V DC power input.

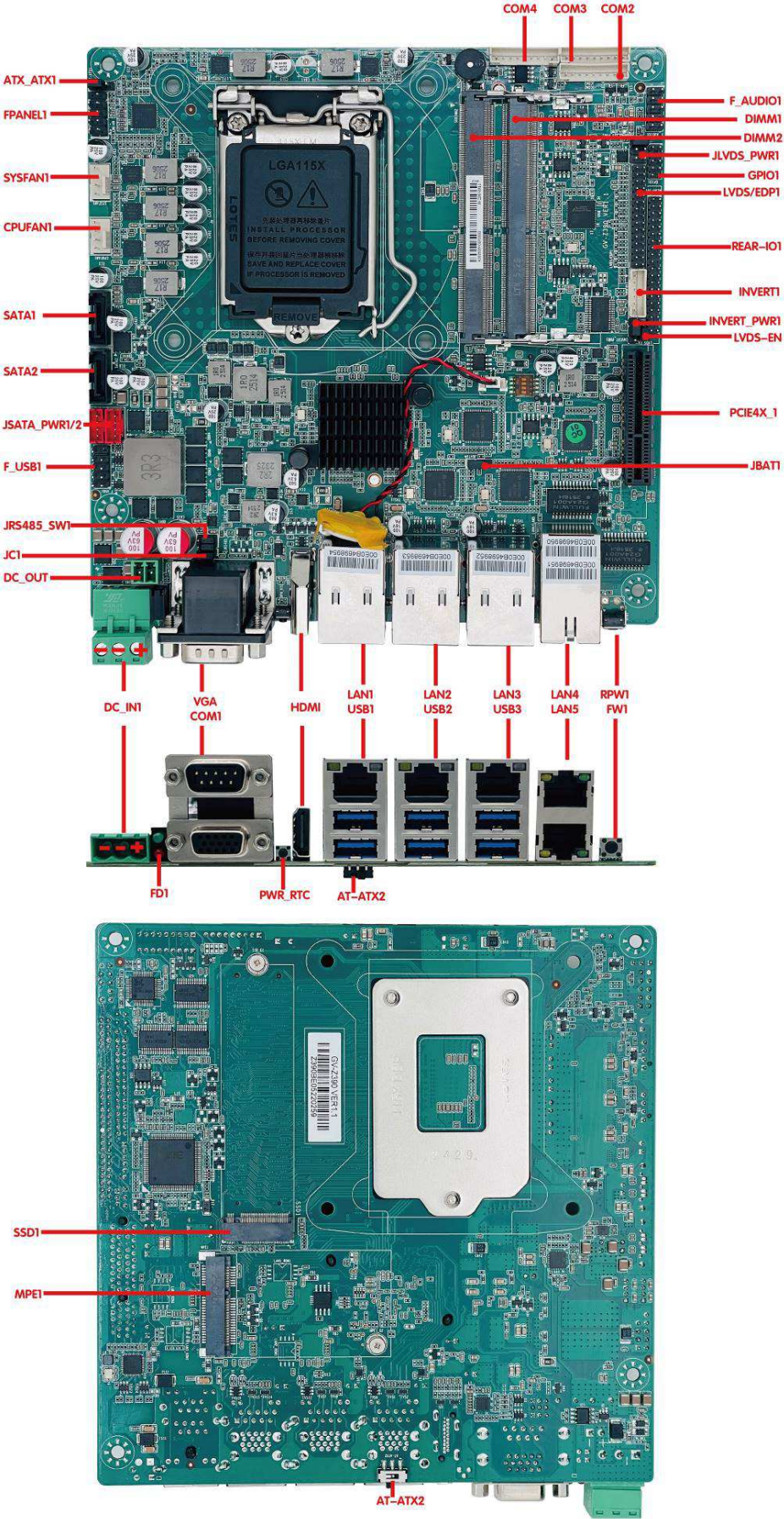
2. Motherboard Block Diagram



3. Motherboard Specifications

Item	Description
Processor	Supports 8th and 9th generation LGA1151 Intel® Celeron®, Pentium®, and Core™ i3/i5/i7 processors
Chipset	Intel® Z390, B360, or Q370 high-speed chipset
Memory	2 × DIMM slots supporting single-channel DDR4-2666, 1.2 V memory, up to 64 GB
Display	Integrated Intel® UHD Graphics supporting DirectX 12, OpenGL 4.5, and 4K display
	1 × VGA port, up to 1920 × 1200 at 60 Hz
	1 × HDMI 1.4 port, up to 4096 × 2304 at 24 Hz
	1 × eDP or LVDS header
Network	4 × Intel® I210-AT Gigabit Ethernet controllers and 1 × Intel® I219-LM Gigabit Ethernet controller; supports Wake-on-LAN and PXE boot
Storage	1 × M.2 Key M slot supporting automatic NVMe (PCIe x4) or SATA detection
	2 × 7-pin SATA 3.0 ports, up to 6 Gbps
Audio	Onboard ALC897 6-channel HD audio controller; internal header supports Line-out and Mic-in
Expansion Slots	1 × Mini PCIe slot supporting Wi-Fi/Bluetooth
	1 × PCIe 3.0 x4 slot
Rear I/O	1 × HDMI 1.4 display port
	1 × VGA display port
	1 × DB9 COM1 port
	6 × USB 3.0 ports
	1 × 1 × 3-pin Phoenix power-input terminal; refer to the marking diagram for polarity
	5 × RJ45 Gigabit Ethernet ports (four I210 ports and one I219 port)
	1 × push-button switch, sharing the mechanical position with the front wired-switch Phoenix terminal and mutually exclusive with the RPW1 push-button switch
	1 × LED for HDD activity and power indication
	1 × Clear CMOS push-button switch, optionally configurable as a one-key recovery button
	1 × auto power-on DIP switch on the rear side of the motherboard
Internal I/O	1 × 1 × 2-pin Phoenix power-output terminal

	1 × USB 2.0 header supporting two USB 2.0 ports
	2 × red SATA power terminals supporting 5 V/12 V
	1 × 2 × 5-pin front-panel switch and LED header
	3 × 1 × 9-pin COM2/3/4 headers
	1 × 40-pin multifunction expansion header supporting COM5 TTL, COM6 TTL, LPC-to-TPM, one USB 2.0/TTL interface, SMBus, and 3 V/5 V
	1 × front-audio header supporting Line-out and Mic-in
Fan Headers	1 × 4-pin CPU fan header and 1 × 4-pin system fan header
GPIO	Supports four GPIO input/output channels
BIOS	64Mb Flash ROM
Watchdog	Supports hardware reset watchdog with 256 levels from 0 to 255 seconds
Operating System	Windows 10/Windows 11/Linux
Power Supply	9-36 V DC power input; refer to the marking diagram for polarity
Operating Temperature	60°C~-10°C
Storage Temperature	-20°C~70°C
Operating Humidity	5%-95% relative humidity, non-condensing
Dimensions	170mm x 170mm



The image can be enlarged for viewing. Pin 1 of each header is marked with a red triangle.

Note: The image above shows the front view of GV-Z390 VER1.1. The actual product may vary.

The diagram above shows the I/O dimensions of GV-Z390 VER1.1.

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4. Board Installation

Safety Precautions:

Before installing the motherboard, please read and follow the safety precautions below:

- Do not remove or damage the serial number label, distributor warranty label, or any other warranty-related labels on the motherboard before installation. Otherwise, it may affect the warranty validation.
- Before installing or removing the motherboard or any other hardware devices, make sure the power is turned off and the power cord is unplugged from the power outlet.
- When installing hardware devices into the motherboard connectors or slots, make sure the connectors are firmly and properly seated.
- When handling the motherboard, avoid touching the metal contacts or circuit areas to prevent short circuits.
- When handling the motherboard, CPU, or memory module, it is recommended to wear an anti-static wrist strap. If an anti-static wrist strap is not available, make sure your hands are dry and touch a grounded metal object first to discharge static electricity.
- Before installation, place the motherboard on an anti-static mat or inside an anti-static bag.
- Before unplugging the power connector from the motherboard, make sure the power supply is turned off.
- Before turning on the power, make sure the power supply voltage is set according to the local voltage standard.
- Before turning on the power, make sure all hardware cables and power cables are correctly connected.
- Do not allow screws to contact the circuits or components on the motherboard, as this may cause damage or malfunction.
- Make sure no screws or metal objects are left on the motherboard or inside the computer chassis.
- Do not place the computer system on an unstable surface.
- Do not place the computer system in a high-temperature environment.
- Turning on the power during installation may cause damage to the motherboard, other devices, or personal injury.
- If you are not familiar with the installation process, or if you encounter any technical problems while using this product, please consult qualified technical personnel.

Memory Installation

This motherboard provides **2 × 288-pin DDR4 DIMM memory slot**.

Before installing the memory module, please note the following:

- 1) Make sure the memory module you purchased is compatible with the specifications supported by this motherboard.
- 2) Before installing or removing the memory module, make sure the computer power is turned off to prevent damage.
- 3) The memory module is designed with a foolproof notch. If the insertion direction is incorrect,

the module cannot be inserted. In this case, please change the insertion direction immediately.

Memory Installation Steps:

- 1) Before installing or removing the memory module, turn off the power and unplug the AC power cord.
- 2) Carefully hold the memory module by both edges. Do not touch the metal contacts.
- 3) Align the gold fingers of the memory module with the memory slot. Make sure the notch on the memory module matches the key in the slot.
- 4) Insert the memory module into the slot at an angle of approximately 30 degrees, then gently press it down until you hear a “click” sound. This indicates that the memory module has been properly installed and is ready for use.

Note: Do not apply excessive force when pressing down the memory module to avoid damage.

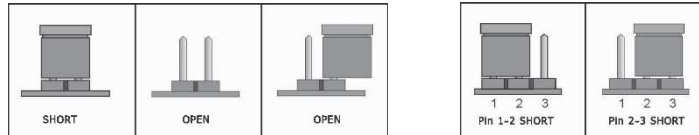
- 5) To remove the memory module, push the retaining clips on both sides of the DIMM slot outward at the same time, then remove the memory module carefully.

5. Jumper Settings

Jumper Description

For a **2-pin header**, installing a jumper cap on the two pins will close the circuit, creating a short connection.

For a **3-pin header**, the jumper cap can be installed on **Pin 1–2** or **Pin 2–3** to close the corresponding circuit and create a short connection.



How to Identify Pin 1 of a Jumper?

- 1) Carefully check the motherboard. The pin marked with “1” or indicated by a thick white line is usually Pin 1.
- 2) Check the solder pads on the back side of the motherboard. In most cases, the square solder pad indicates Pin 1.

Clear CMOS Jumper:

The motherboard provides 1 × 1×3-pin Clear CMOS header JBAT1 for clearing or retaining CMOS settings.

Pin pitch: 2.54 mm

The CMOS is powered by the onboard button battery. Clearing the CMOS will permanently erase the previous system configuration and restore the system settings to the default factory values.

To clear the CMOS, follow the steps below:

- 1) Turn off the computer and disconnect the power supply.
- 2) Short Pin 2–3 of JBAT1 for approximately 5 seconds.
- 3) Power on the computer.
- 4) During startup, follow the on-screen prompt to enter BIOS Setup, then load the optimized default settings.
- 5) Save the settings and exit BIOS Setup.

Pin definition is shown below:

JBAT1 Definition:

Function	JBAT1 Setting
Normal operation	Pin 1–2 shorted
Clear CMOS and restore all BIOS settings to factory defaults	Pin 2–3 shorted

AT/ATX Power Mode Jumper

The motherboard provides 1 × 1×3-pin **AT-ATX1 jumper** for selecting the power-on mode.

Pin pitch: 2.54 mm

The power-on behavior can be configured by the jumper setting.

AT-ATX1 Definition:

Function	AT-ATX1 Setting
Disable Auto Power-on	1-2Pin
Enable Auto Power-on	2-3Pin

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6. Pin Definitions

6.1. The motherboard supports six RS232 serial ports. COM1 and COM2 can support RS485. COM1 is a standard DB9 port, COM2/3/4 use 1 × 9-pin headers, and COM5/6 are provided through the RAER-IO header.

The COM1 DB9 pin definition is as follows:

PIN	Signal Name	PIN	Signal Name
1	DCD (A)	2	RXD (B)
3	TXD	4	DTR
5	GND	6	DSR
7	RTS	8	CTS
9	RI		

The COM1 jumper settings for RS485 are as follows:

Interface	Function	JRS485_SW1 Setting	JC1 Setting	Definition
COM1	RS232	1-3Pin ,2-4Pin (Default)	1-3Pin (Default)	COM1 Pin 2: RXD COM1 Pin 3: TXD
	RS485	3-5Pin ,4-6Pin	3-5Pin	COM1 Pin 1: A COM1 Pin 2: B

COM2/3/4 use 1 × 9-pin headers (COM2 requires a hardware modification to support RS485), with a 2.0 mm pitch.

The pin definition is as follows:

PIN	Signal Name	PIN	Signal Name
1	DCD (A)	2	RXD (B)
3	TXD	4	DTR
5	GND	6	DSR
7	RTS	8	CTS
9	RI		

6.2. The motherboard provides one multifunction RAER-IO expansion header supporting COM5 TTL, COM6 TTL, LPC-to-TPM, one USB 2.0/TTL interface, SMBus, and 3 V/5 V. The connector is a 2 × 20-pin header with a 2.0 mm pitch.

The RAER-IO pin definition is as follows:

Pin	Signal Name	Pin	Signal Name
1	COM5_RXD	2	COM6_RXD
3	COM5_TXD	4	COM6_TXD
5	COM5_RTS	6	COM6_RTS
7	COM5_DTR	8	COM6_DTR
9	COM5_DSR	10	COM6_DSR
11	COM5_CTS	12	COM6_CTS
13	GND	14	GND
15	Data0+	16	SMB_CLK_MAIN
17	Data0-	18	SMB_DATA_MAIN
19	NC	20	NC
21	NC	22	-LFRAME
23	GND	24	LAD0
25	GND	26	LAD1
27	GND	28	LAD2
29	GND	30	LAD3
31	VCC5	32	GND
33	VCC5	34	PCIRST-
35	VCC5	36	CLK_LPC24M_IO

37	VCC3	38	VCC3
39	VCC5	40	SER_IRQ

6.3. The motherboard provides one 2 × 5-pin front-audio header with a 2.54 mm pitch. The F_AUDIO1 pin definition is as follows:

Pin	Signal Name	Pin	Signal Name
1	MIC-L	2	GND
3	MIC-R	4	NC
5	Line out-R	6	Sense Return1
7	GND	8	NC
9	Line OUT-L	10	Sense Return2

6.4. The motherboard provides one 2 × 15-pin LVDS header with a 2.0 mm pitch. The LVDS pin definition is as follows:

Pin	Signal Name	Pin	Signal Name
1	LCDVDD	2	LCDVDD
3	LCDVDD	4	NC
5	GND	6	GND
7	LVDS_A0-	8	LVDS_A0+
9	LVDS_A1-	10	LVDS_A1+
11	LVDS_A2-	12	LVDS_A2+
13	GND	14	GND
15	LVDSA_CLK-	16	LVDSA_CLK+
17	LVDS_A3-	18	LVDS_A3+
19	LVDS_B0-	20	LVDS_B0+
21	LVDS_B1-	22	LVDS_B1+
23	LVDS_B2-	24	LVDS_B2+
25	GND	26	GND
27	LVDSB_CLK-	28	LVDSB_CLK+
29	LVDS_B3-	30	LVDS_B3+

For eDP configuration, refer to the following pin definition:

PIN	Signal Name	PIN	Signal Name
1	PVDD	2	PVDD
3	NC	4	NC
5	EDP_TX0+	6	EDP_TX0-
7	GND	8	GND
9	EDP_TX1+	10	EDP_TX1-
11	GND	12	GND
13	EDP_TX2+	14	EDP_TX2-
15	GND	16	GND
17	EDP_TX3+	18	EDP_TX3-
19	GND	20	GND
21	EDP_AUX+	22	EDP_AUX-
23	GND	24	HPD_DET
25	BKLT_PWM Backlight Brightness Control	26	BKLT_EN (Backlight Enable)
27	GND	28	GND
29	INVERT_PWR (Backlight Power)	30	INVERT_PWR (Backlight Power)

The motherboard provides selectable 3.3 V, 5 V, and 12 V panel operating voltages, as well as selectable 5 V and 12 V panel backlight supply voltages.

Before using LVDS, confirm the rated operating voltage required by the panel. The LCD can

operate normally only when the selected LCD voltage matches the panel voltage. The settings are as follows:

INVERTER1 (Backlight Power Connector) Definition:

Pin	Signal Name
1	12 V/5 V (set by INVERT_PWR1)
2	12 V/5 V (set by INVERT_PWR1)
3	Backlight Enable
4	Backlight Brightness Control
5	GND
6	GND

INVERT_PWR1 (Panel Backlight Power) Settings:

Interface	Function	INVERT_PWR1 Setting
LVDS/E DP	12V (Default)	1-2 Pin
	5V	2-3 Pin

JLVDS_PWR1 (Panel Operating Voltage) Settings:

Interface	Function	JLVDS_PWR1 Setting
LVDS/E DP	3.3V (Default)	1-2 Pin
	5V	3-4 Pin
	12V	5-6 Pin

LVDS Enable Jumper: The motherboard provides one 1 × 3-pin LVDS_EN1 jumper with a 2.54 mm pitch. This jumper enables or disables the LVDS function.

LVDS_EN Definition:

Interface	Function	LVDS_EN Setting
LVDS1	Disable LVDS	1-2Pin
	Enable LVDS	2-3Pin

The onboard SW1 DIP switch is used to set the LVDS resolution. Detailed settings are shown below:

No.	DIP Switch Setting	Resolution / Bit Depth	No.	DIP Switch Setting	Resolution / Bit Depth	No.	DIP Switch Setting	Resolution / Bit Depth
1		800x600 Single-channel 6-bit	2		1024x768 Single-channel 6-bit	3		1280x768 Single-channel 6-bit
4		1280x800 Single-channel 6-bit	5		1280x960 Single-channel 6-bit	6		1280x1024 Dual-channel 8-bit

7		1366*768 Single-channel 6-bit	8		1366x768 Single-channel 8-bit	9		1440x900 Dual-channel 8-bit
10		1024*600 Single-channel 6-bit	11		1920x1080 Dual-channel 6-bit 15.6 inches	12		1920x1080 Dual-channel 8-bit 21.5 inches
13		1920x1080 Dual-channel 8-bit 42 inches	14		1280x1024 Dual-channel 8-bit	15		1280x800 Single-channel 8-bit
16		1024x768 Single-channel 8-bit	17			18		

6.5. The motherboard provides two USB 2.0 headers in 2×5 -pin form with a 2.54 mm pitch. The F_USB1 pin definition is as follows:

Pin	Signal Name	Pin	Signal Name
1	+5V	2	+5V
3	Data0-	4	Data1-
5	Data0+	6	Data1+
7	GND	8	GND
9		10	GND

6.6. The motherboard provides two 1×4 -pin fan headers. The CPUFAN1 and SYSFAN1 pin definitions are as follows:

Pin	Signal Name
1	GND
2	+12V
3	DET
4	PWM

Note: DET is the fan-speed pulse output; PWM controls the fan speed.

6.7. The motherboard provides one 2×5 -pin FPANEL1 header with a 2.54 mm pitch. The chassis power switch, reset switch, HDD LED, and power LED can be connected to this header. The FPANEL1 pin definition is as follows:

Pin	Signal Name	Pin	Signal Name
1	HDDLED+	2	PWRLED+
3	HDDLED-	4	PWRLED-
5	GND	6	PWRBTN#
7	RESETBTN#	8	GND
9	NC	10	

6.8. The motherboard provides one 2×5 -pin GPIO header with a 2.0 mm pitch. The GPIO1 pin definition is as follows:

Pin	Signal Name	Pin	Signal Name
1	GPO1	2	GPI1

3	GPO2	4	GPI2
5	GND	6	GPI3
7	GPO3	8	GPI4
9	GPO4	10	+5V

6.9. The motherboard provides one 1 × 2-pin Phoenix power-output terminal with a 3.8 mm pitch.

The DC_OUT pin definition is as follows:

Pin	Signal Name	Pin	Signal Name
1	9-36V	2	GND

6.10. The motherboard provides one 1 × 2-pin Phoenix terminal for the front-panel wired switch, with a 3.8 mm pitch. The FW1 pin definition is as follows:

Pin	Signal Name	Pin	Signal Name
1	SW	2	GND

6.11. The motherboard provides two red SATA power terminals with a 3.8 mm pitch. The JSATA_PWR1 and JSATA_PWR2 pin definitions are as follows:

Pin	Signal Name	Pin	Signal Name
1	+12V	2	GND
3	GND	4	+5V

6.12. The motherboard provides one 1 × 3-pin Phoenix power-input terminal. Polarity is marked on the motherboard silkscreen. The DC_IN1 pin definition is as follows:

Pin	Signal Name
1	GND
2	GND
3	9-36V

The motherboard is designed for a maximum power consumption of 200 W. The following AC-side measurements were recorded during bare-board stress testing with a 19 V Huntkey power supply and are provided only as a reference for selecting a power adapter.

Series	Model	Clock Frequency	TDP	Maximum Power (Power Meter)	Long-Term Stable Power (Power Meter)
Core™	I5-6400	4 cores / 4 threads, 2.7 GHz, up to 3.3 GHz	65W	110W	105W
Core™	I3-8350K	4 cores / 4 threads, 4.0 GHz	91W	137W	135W
Core™	I5-8600	6 cores / 6 threads, 3.1 GHz, up to 4.3 GHz	65W	191W	120W
Core™	I5-9600K	6 cores / 6 threads, 3.7 GHz, up to 4.6 GHz	95W	137W	135W
Core™	I7-9700	8 cores / 8 threads, 3.0 GHz, up to 4.7 GHz	65W	170W	124W