IEI Integration Corp.

MODEL:

KINO-DH420

Mini-ITX SBC supports LGA1200 Intel® 10th Generation Core™ i9/i7/i5/i3, Celeron® and Pentium® processor, DDR4, dual independent displays, triple 2.5GbE LAN, M.2, SATA 6Gb/s, HD Audio and RoHS

User Manual

Rev. 1.00 – May 5, 2022

RoHS Lead Free

Revision

Date	Version	Changes
May 5, 2022	1.00	Initial release

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Manual Conventions

WARNING

Warnings appear where overlooked details may cause damage to the equipment or result in personal injury. Warnings should be taken seriously.

CAUTION

Cautionary messages should be heeded to help reduce the chance of losing data or damaging the product.

NOTE

These messages inform the reader of essential but non-critical information. These messages should be read carefully as any directions or instructions contained therein can help avoid making mistakes.

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Introduction

1.1 Introduction

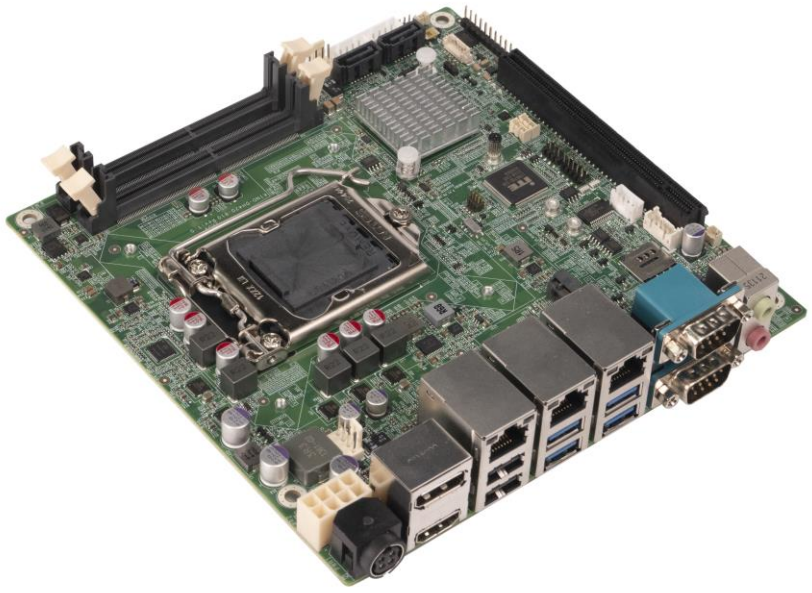


Figure 1-1: KINO-DH420

The KINO-DH420 is a Mini-ITX motherboard. It accepts a Socket LGA1200 Intel® Core™ i7/i5/i3, Pentium® or Celeron® processor and supports two 260-pin 2933 MHz dual-channel DDR4 SDRAM unbuffered SO-DIMM supporting up to 64GB.

The KINO-DH420 provides three 2.5 GbE interfaces through the Intel® I225V /I225LM PCIe GbE controllers. The integrated Intel® H420E chipset supports two SATA 6Gb/s drives, one M.2 (3042/3052/2242/2280) B key slot supporting PCIe x2 and USB 2.0 signal and one M.2 2230 A-key slot supporting PCIe x1 and USB 2.0 signals. In addition, the KINO-DH420 includes one HDMI port and one DP port for dual independent display.

Expansion and I/O include one PCIe x16 slot, four USB 3.2 Gen1 on the rear panel, two USB 2.0 ports on the rear I/O and two USB 2.0 by pin headers, three RS-232 ports and one RS-422/485 port. High Definition Audio (HDA) support ensures HDA devices can be easily implemented on the KINO-DH420.

1.2 Features

Some of the KINO-DH420 motherboard features are listed below:

- Mini-ITX form factor
- 10th generation LGA1200 Intel® Core™ i7/i5/i3, Pentium® or Celeron® processor supported
- Intel® H420E chipset
- Two 260-pin 2933 MHz dual-channel unbuffered DDR4 SO-DIMMs supported (system max. 64 GB)
- Three 2.5 GbE connectors via Intel ® I225V /I225LM PCIe GbE controllers
- Dual independent display by one HDMI port and one DP port
- Two SATA 6Gb/s connectors
- One M.2 (3042/3052/2242/2280) B-key slot supporting PCIe x2 and USB 2.0 signals; one M.2 2230 A-key slot supporting PCIe x1 and USB 2.0 signals
- One PCIe 3.0 x16 slot
- Four USB 3.2 Gen1 (5Gb/s) ports on the rear I/O
- Two USB 2.0 ports on the rear I/O
- Two USB 2.0 ports via internal pin headers
- Two RS-232 serial ports on the rear I/O
- One RS-232 serial port and one RS-422/485 port via internal pin headers
- High Definition Audio
- RoHS compliant

1.3 Connectors

The connectors on the KINO-DH420 are shown in the figure below.

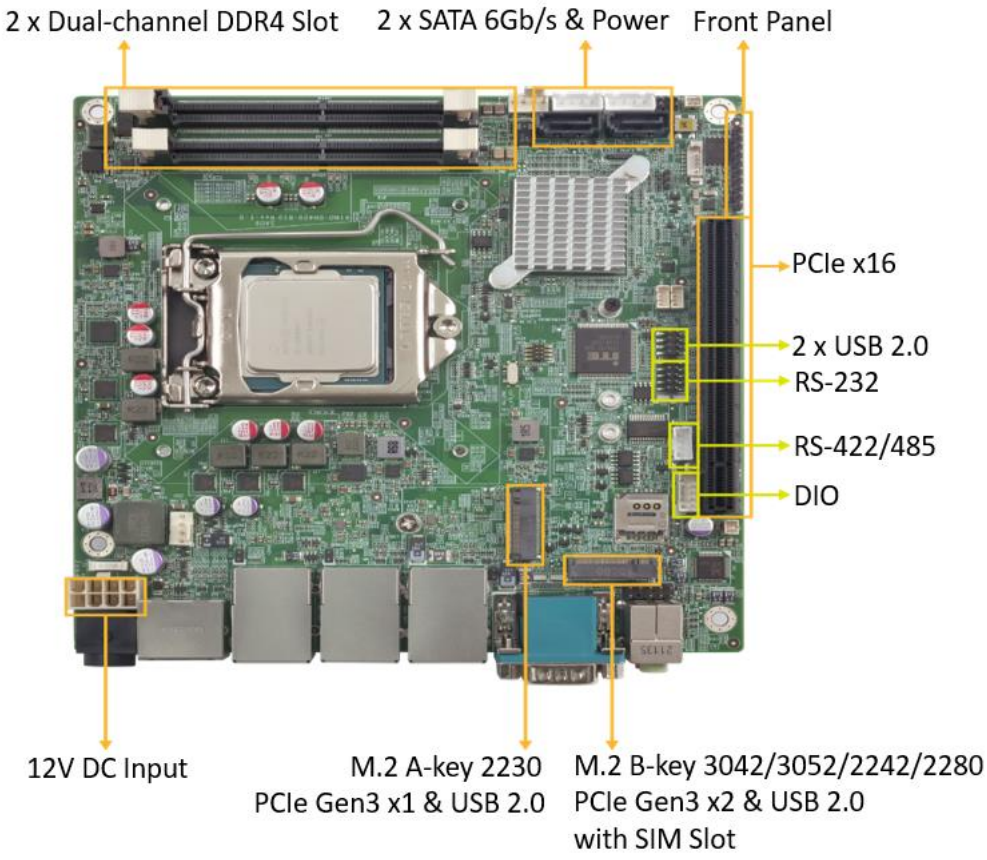


Figure 1-2: Connectors

1.4 Dimensions

The main dimensions of the KINO-DH420 are shown in the diagram below.

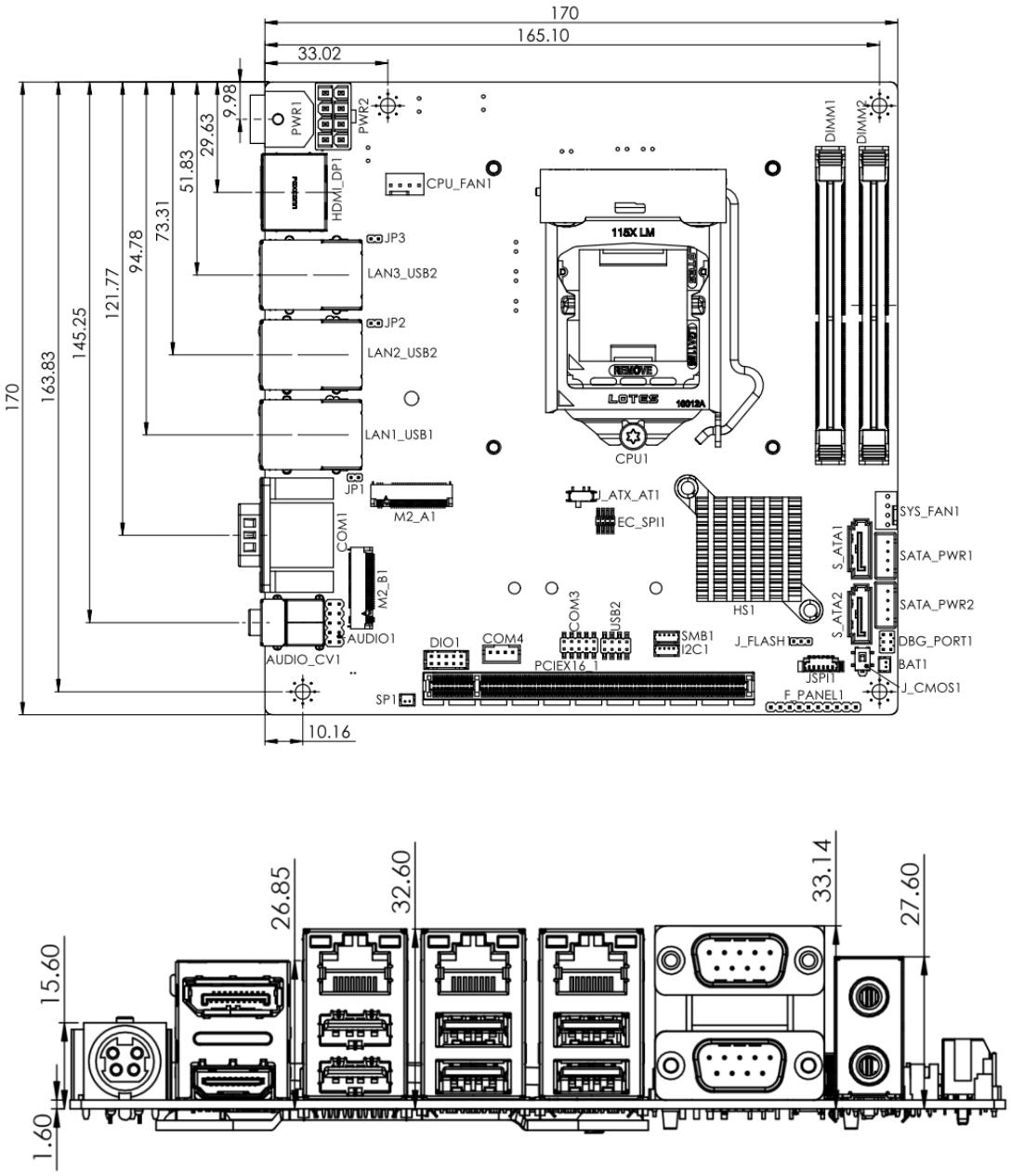


Figure 1-3: KINO-DH420 Dimensions (mm)

1.5 Data Flow

The following diagram shows the data flow between the system chipset, the CPU and other components installed on the motherboard.

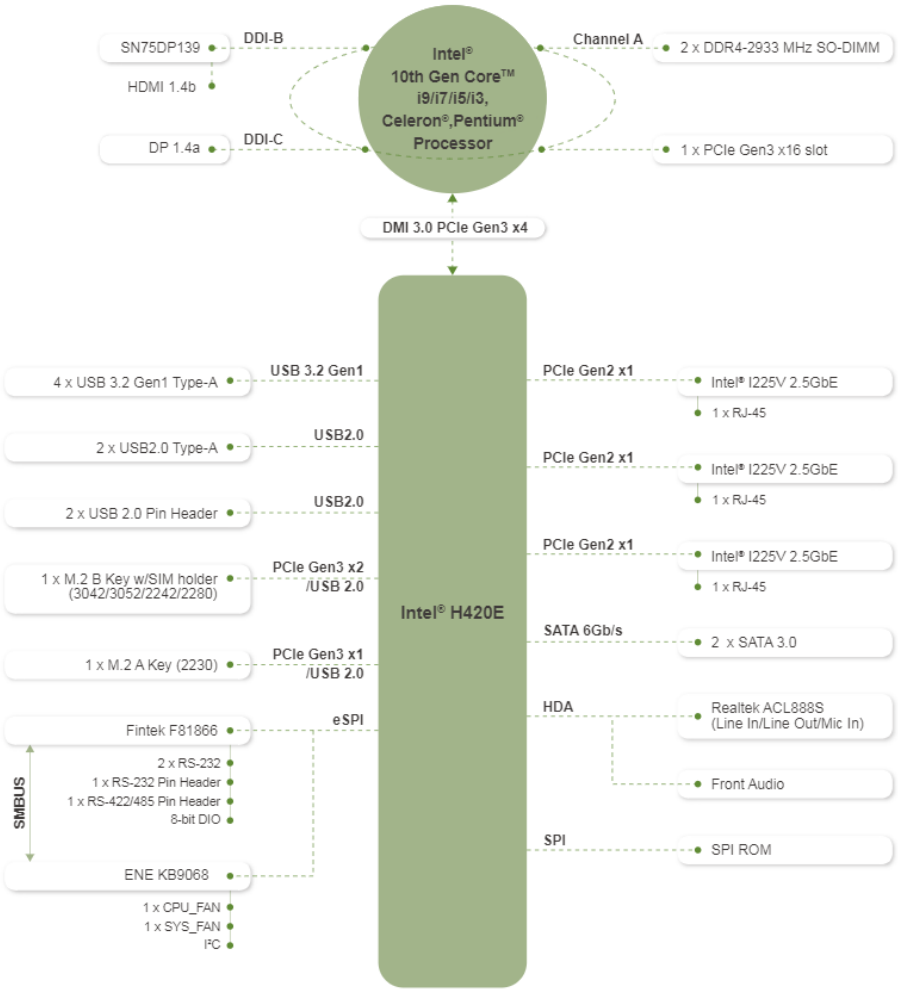


Figure 1-4: Data Flow

1.6 Technical Specifications

The KINO-DH420 technical specifications are listed below.

Specification/Model	KINO-DH420
Form Factor	Mini-ITX
CPU Supported	10th generation LGA1200 Intel® Core™ i7/i5/i3, Pentium® or Celeron® CPU (35 W / 65 W)
PCH	Intel® H420E
Memory	Two 260-pin 2933 MHz dual-channel unbuffered DDR4 SDRAM SO-DIMMs supported (system max. 64 GB)
Graphics Engine	Intel® HD Graphics Gen9 engine with 16 low-power execution units, supporting DX11.3/12, OpenGL 4.3/4.4/4.5 and OpenCL 1.2/2.0/2.1
Display Output	Supports dual independent display One HDMI port (up to 4096 x 2160@30Hz) One DP port (up to 4096 x 2304 @60Hz)
Ethernet Controllers	Two Intel ® I225V and one Intel® I225LM PCIe 2.5 GbE controller
Audio	Realtek ALC888S HD codec
BIOS	AMI UEFI BIOS
Super I/O Controller	Fintek F81966D-I(D)
Watchdog Timer	Software programmable supports 1~255 sec. system reset
Expansions	One PCIe x16 slot (Gen 3) One M.2 B key (3042/3052/2242/2280) w/ SIM holder (PCIe Gen 3 x2 and USB 2.0 signals) One M.2 A key (2230) (PCIe Gen 3 x1 and USB 2.0 signals)
I/O Interface Connectors	
Audio Connectors	Line-out and mic-in audio jacks on rear panel One internal front panel audio connector (10-pin header)
Digital I/O	8-bit digital I/O

Ethernet	Three RJ-45 2.5 GbE ports
Fan	One 4-pin CPU smart fan connector One 4-pin system smart fan connector
Front Panel	One 10-pin header (power LED, HDD LED, speaker, power button, reset button)
I²C	One 4-pin wafer connector
LAN LED	Three 2-pin headers for LAN1 LED, LAN2 LED and LAN3 LED
Serial ATA	Two SATA 6Gb/s connectors (no RAID) Two 5 V / 12 V SATA power connectors
Serial Ports	One RS-232 via internal 10-pin header One RS-422/485 via internal 4-pin wafer Two RS-232 DB-9 on rear panel
SMBus	One 4-pin wafer connector
USB 2.0	Two USB 2.0 ports via internal pin headers Two USB 2.0 on rear panel
USB 3.2	Four USB 3.2 Gen1 (5Gb/s) ports on rear panel
Environmental and Power Specifications	
Power Supply	12 V DC input One external DC jack (4-pin DIN) One internal power connector (8-pin) AT/ATX power support ErP/EuP compliant
Power Consumption	12V@12.408A (Intel® Core™ i7-10900E CPU with two 32 GB 2933 MHz DDR4 memory, EuP/ErP mode disabled)
Operating Temperature	0ºC ~ 60ºC
Storage Temperature	-30ºC ~ 70ºC
Operating Humidity	5% ~ 95% (non-condensing)
Safety	CE, FCC
Physical Specifications	

Dimensions	170 mm x 170 mm
Weight (GW/NW)	900 g / 400 g

Table 1-1: KINO-DH420 Specifications

Chapter

2

Packing List

2.1 Anti-static Precautions

WARNING!

Static electricity can destroy certain electronics. Make sure to follow the ESD precautions to prevent damage to the product, and injury to the user.

Make sure to adhere to the following guidelines:

- ***Wear an anti-static wristband***: Wearing an anti-static wristband can prevent electrostatic discharge.
- ***Self-grounding***: Touch a grounded conductor every few minutes to discharge any excess static buildup.
- ***Use an anti-static pad***: When configuring any circuit board, place it on an anti-static mat.
- ***Only handle the edges of the PCB***: Don't touch the surface of the motherboard. Hold the motherboard by the edges when handling.

2.2 Unpacking Precautions

When the KINO-DH420 is unpacked, please do the following:

- Follow the anti-static guidelines above.
- Make sure the packing box is facing upwards when opening.
- Make sure all the packing list items are present.

2.3 Packing List

NOTE:

If any of the components listed in the checklist below are missing, do not proceed with the installation. Contact the IEI reseller or vendor the KINO-DH420 was purchased from or contact an IEI sales representative directly by sending an email to sales@ieiworld.com.

The KINO-DH420 is shipped with the following components:

Quantity	Item and Part Number	Image
1	KINO-DH420 single board computer	
1	SATA and power cable	
1	I/O shielding	
1	Quick installation guide	

Table 2-1: Packing List

2.4 Optional Items

The following are optional components which may be separately purchased:

Item and Part Number	Image
Dual USB cable (wo bracket) (**P/N**: 32001-008600-200-RS)	
RS-232 cable (**P/N:** 32205-002700-200-RS)	
RS-422/485 cable (**P/N**: 32205-003800-300-RS)	
High-performance LGA1155/1156/LGA1200 cooler kit (1U chassis compatible, 73W) (**P/N**: CF-115XA-R10)	
LGA1155/LGA1156/LGA1200 cooler kit (1U chassis compatible, 45W) (**P/N**: CF-1156C-R20)	
LGA1155/LGA1156/LGA1200 cooler kit (1U chassis compatible, 65W) (**P/N**: CF-1156D-R30)	

Table 2-2: Optional Items

Chapter

3

Connectors

3.1 Peripheral Interface Connectors

This chapter details all the peripheral interface connectors.

3.1.1 KINO-DH420 Layout

The figure below shows all the peripheral interface connectors.

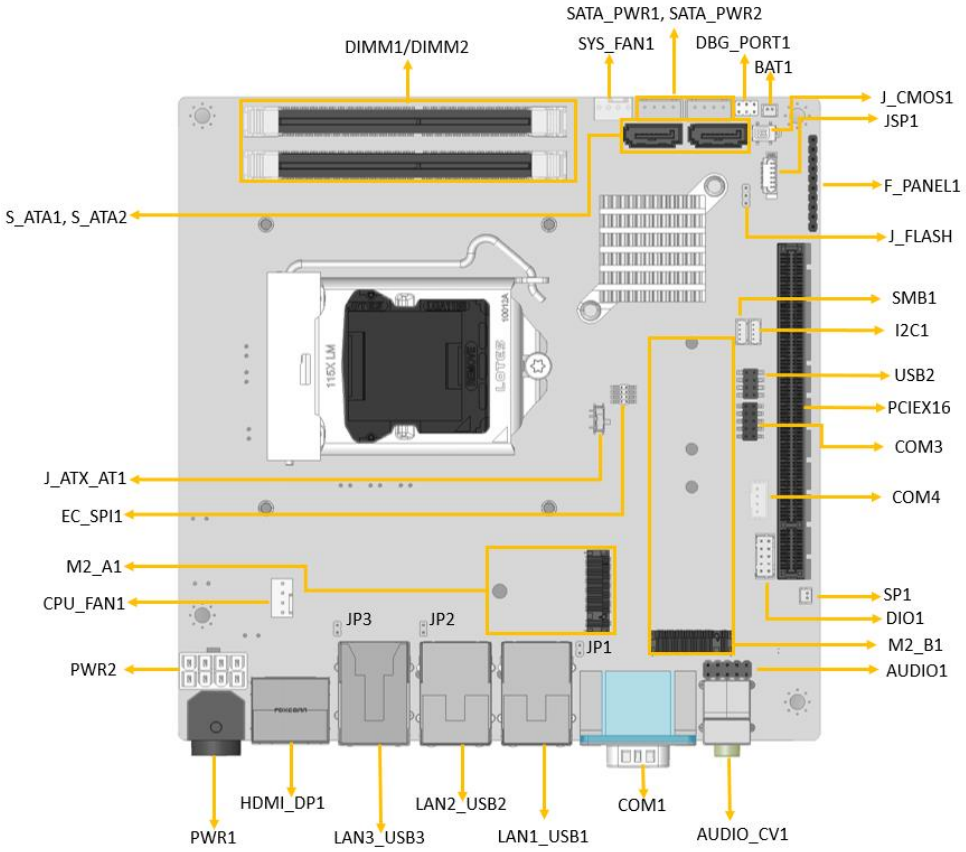


Figure 3-1: Peripheral Interface Connectors (Front Side)

3.1.2 Peripheral Interface Connectors

The table below lists all the connectors on the board.

Connector	Type	Label
Audio connector	10-pin header	AUDIO1
Battery connector	2-pin wafer	BAT1

Connector	Type	Label
Buzzer connector	2-pin wafer	SP1
DDR4 SO-DIMM sockets	260-pin DDR4 SO-DIMM socket	DIMM1, DIMM2
Digital I/O connector	10-pin header	DIO1
Fan connector (CPU)	4-pin wafer	CPU_FAN1
Fan connector (system)	4-pin wafer	SYS_FAN1
Front panel connector	10-pin header	F_PANEL1
I2C connector	4-pin wafer	I2C1
Internal power connector	8-pin Molex	PWR2
LAN LED connectors	2-pin header	JP1, JP2, JP3
M.2 slot, A-key	M.2 A-key slot	M2_A1
M.2 slot, B-key	M.2 B-key slot	M2_B1
PCIe x16 slot	PCIe x16 slot	PCIEX16_1
RS-232 serial port	10-pin header	COM3
RS-422/485 serial port	4-pin wafer	COM4
SATA 6Gb/s drive connectors	7-pin SATA connector	S_ATA1, S_ATA2
SATA power connectors	4-pin wafer	SATA_PWR1, SATA_PWR2
SMBus connector	4-pin wafer	SMB1
SPI flash connector	6-pin wafer	JSPI1
SPI flash connector, EC	8-pin wafer	EC_SPI1
USB 2.0 connectors	8-pin header	USB1, USB2

Table 3-1: Peripheral Interface Connectors

3.1.3 External Interface Panel Connectors

The table below lists the connectors on the external I/O panel.

Connector	Type	Label
Audio connector	Audio jacks	AUDIO_CV1
Ethernet and USB 3.2 Gen1 ports	RJ-45 & USB 3.2 Gen1 combo	LAN1_USB1, LAN2_USB2
Ethernet and USB 2.0 ports	RJ-45 & USB 2.0 combo	LAN3_USB2
HDMI and DP connectors	HDMI & DP	HDMI_DP1
Power jack	4-pin DIN	PWR1
RS-232 serial port	DB-9 male	COM1

Table 3-2: External Peripheral Connectors

3.2 Internal Peripheral Connectors

The section describes all of the connectors on the KINO-DH420.

3.2.1 Audio Connector

CN Label: **AUDIO1**

CN Type: 10-pin header, p=2.54 mm

CN Location: See **Figure 3-2**

CN Pinouts: See **Table 3-3**

This connector connects to speakers, a microphone and an audio input.

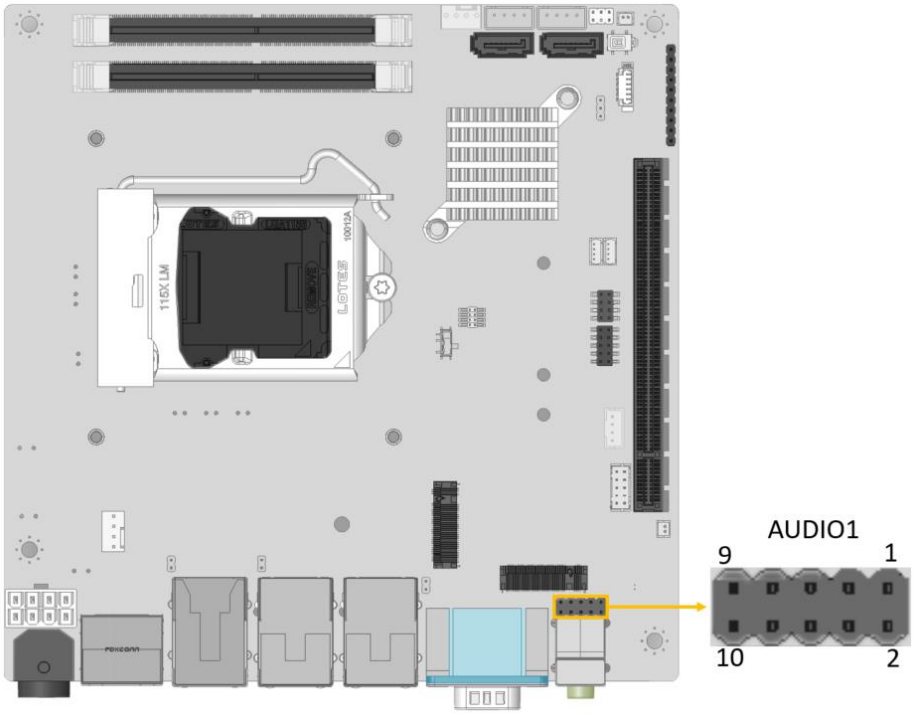


Figure 3-2: Audio Connector Location

Pin	Description	Pin	Description
1	MIC2-L	2	GND
3	MIC2-R	4	PRESENCE#
5	LINE2-R	6	MIC2-JD
7	FRONT-IO	8	NC
9	LINE2-L	10	LINE2-JD

Table 3-3: Audio Connector Pinouts

3.2.2 Battery Connector

CAUTION:

Risk of explosion if battery is replaced by an incorrect type. Only certified engineers should replace the on-board battery.

Dispose of used batteries according to instructions and local regulations.

NOTE:

It is recommended to attach the RTC battery onto the system chassis in which the KINO-DH420 is installed.

CN Label:	**BAT1**
CN Type:	2-pin wafer, p=1.25 mm
CN Location:	See **Figure 3-3**
CN Pinouts:	See **Table 3-4**

A system battery is placed in the battery holder. The battery provides power to the system clock to retain the time when power is turned off.

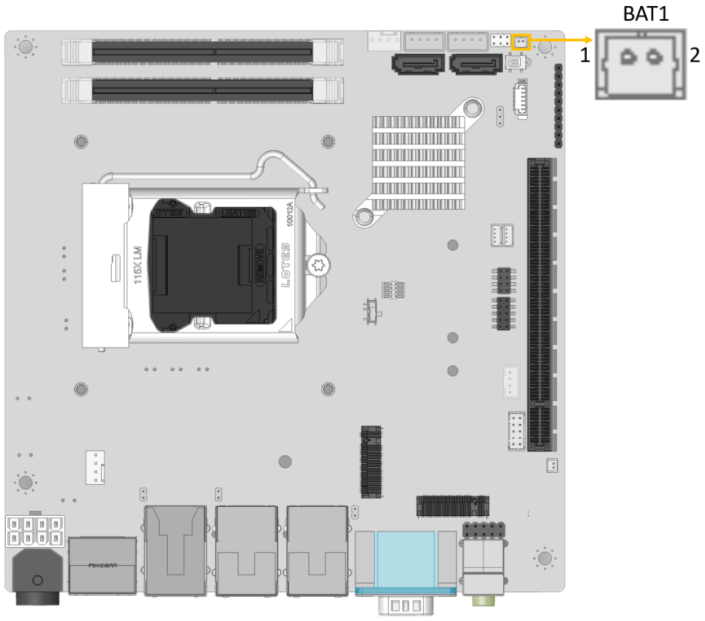


Figure 3-3: Battery Connector Location

Pin	Description
1	Battery+
2	Ground

Table 3-4: Battery Connector Pinouts

3.2.3 Buzzer Connector

NOTE:

If you cannot find a good place to put a buzzer on the KINO-DH420, it is recommended to attach the buzzer onto the system chassis in which the KINO-DH420 is installed.

CN Label:	**SP1**
CN Type:	2-pin wafer, p=1.25 mm
CN Location:	See **Figure 3-4**
CN Pinouts:	See **Table 3-5**

The buzzer connector is connected to a buzzer.

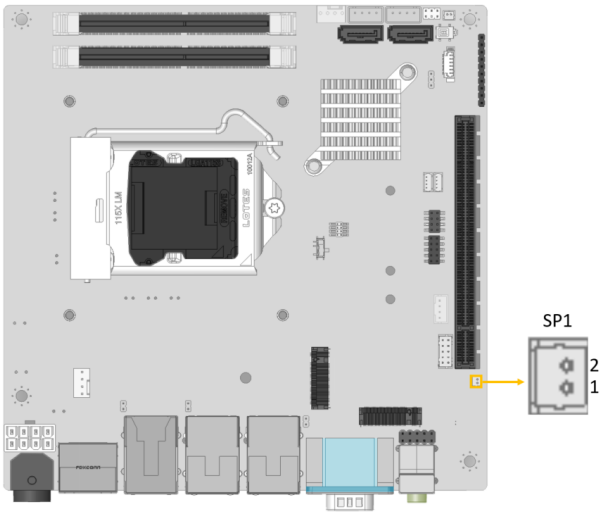


Figure 3-4: Buzzer Connector Location

Pin	Description
1	+V5S
2	PC_BEEP

Table 3-5: Buzzer Connector Pinouts

3.2.4 DDR4 SO-DIMM Sockets

CAUTION:

For dual channel configuration, always install two identical memory modules that feature the same capacity, timings, voltage, number of ranks and the same brand.

CN Label:	**DIMM1, DIMM2**
CN Type:	260-pin DDR4 SO-DIMM socket
CN Location:	See **Figure 3-5**

The SO-DIMM slots are for installing the DDR4 SO-DIMMs.

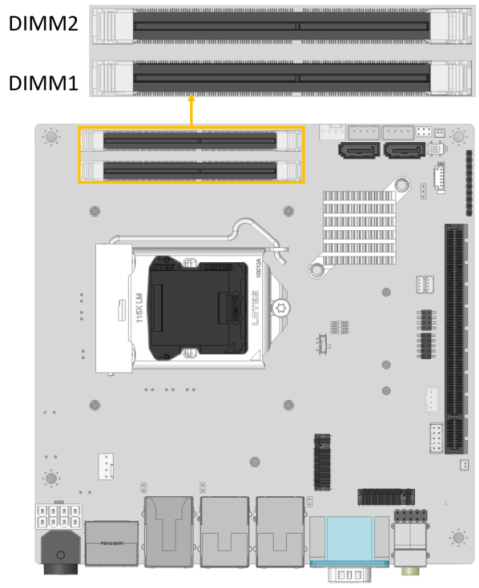


Figure 3-5: DDR4 SO-DIMM Socket Locations

3.2.5 Digital I/O Connector

CN Label: **DIO1**

CN Type: 10-pin header, p=2.00 mm

CN Location: See **Figure 3-6**

CN Pinouts: See **Table 3-6**

The digital I/O connector provides programmable input and output for external devices.

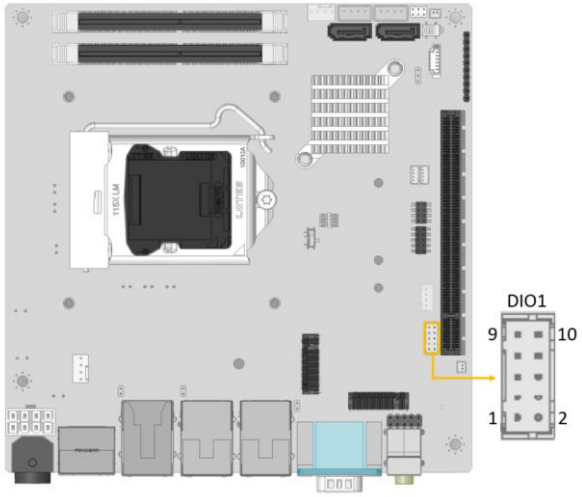


Figure 3-6: Digital I/O Connector Location

Pin	Description	Pin	Description
1	GND	2	VCC5V
3	Output 3	4	Output 2
5	Output 1	6	Output 0
7	Input 3	8	Input 2
9	Input 1	10	Input 0

Table 3-6: Digital I/O Connector Pinouts

3.2.6 Fan Connector (CPU)

CN Label:	**CPU_FAN1**
CN Type:	4-pin wafer, p=2.54 mm
CN Location:	See **Figure 3-7**
CN Pinouts:	See **Table 3-7**

The fan connector attaches to a CPU cooling fan.

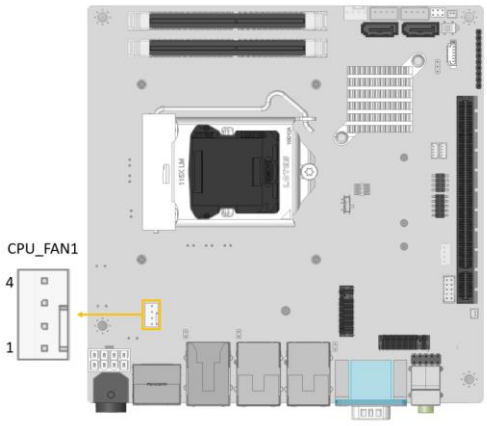


Figure 3-7: CPU Fan Connector Location

Pin	Description
1	GND
2	+12V
3	FANIO
4	PWM

Table 3-7: CPU Fan Connector Pinouts

3.2.7 Fan Connector (System)

CN Label:	**SYS_FAN1**
CN Type:	4-pin wafer, p=2.54 mm
CN Location:	See **Figure 3-8**
CN Pinouts:	See **Table 3-8**

The fan connector attaches to a system cooling fan.

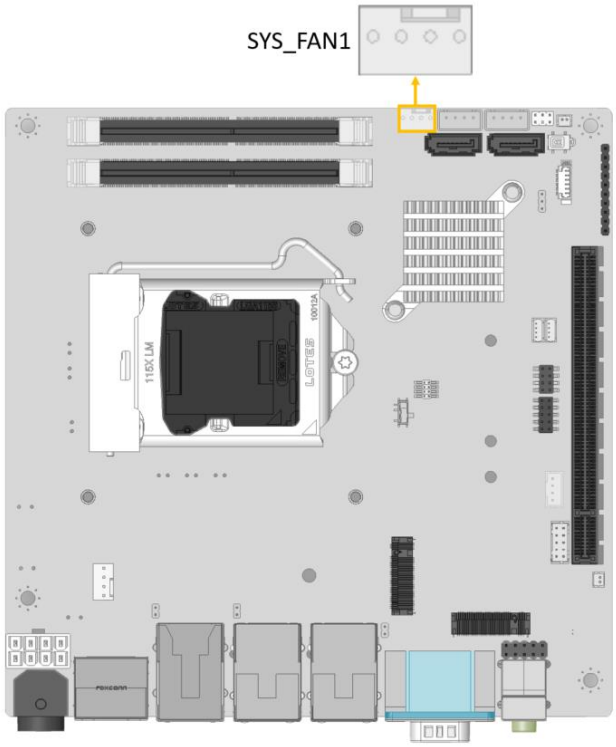


Figure 3-8: System Fan Connector Location

Pin	Description
1	GND
2	+12V
3	FANIO
4	PWM

Table 3-8: System Fan Connector Pinouts

3.2.8 Front Panel Connector

CN Label: **F_PANEL1**

CN Type: 10-pin header, p=2.54 mm

CN Location: See **Figure 3-9**

CN Pinouts: See **Table 3-9**

The front panel connector connects to the indicator LEDs and buttons on the computer's front panel.

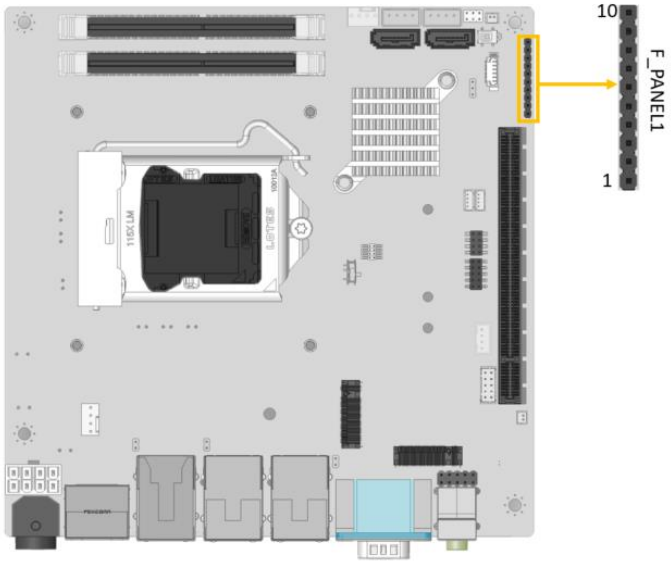


Figure 3-9: Front Panel Connector Location

Function	Pin	Description	Function	Pin	Description
	1	NC	Power LED	6	PWR_LED+
Power Button	2	PWR_BTN+		7	PWR_LED+
	3	PWR_BTN-		8	PWR_LED-
HDD LED	4	HDD_LED+	Reset	9	RESET+
	5	HDD_LED-		10	RESET-

Table 3-9: Front Panel Connector Pinouts

3.2.9 I²C Connector

CN Label:	**I2C1**
CN Type:	4-pin wafer, p=1.25 mm
CN Location:	See **Figure 3-10**
CN Pinouts:	See **Table 3-10**

The I²C connector is used to connect I²C-bus devices to the motherboard.

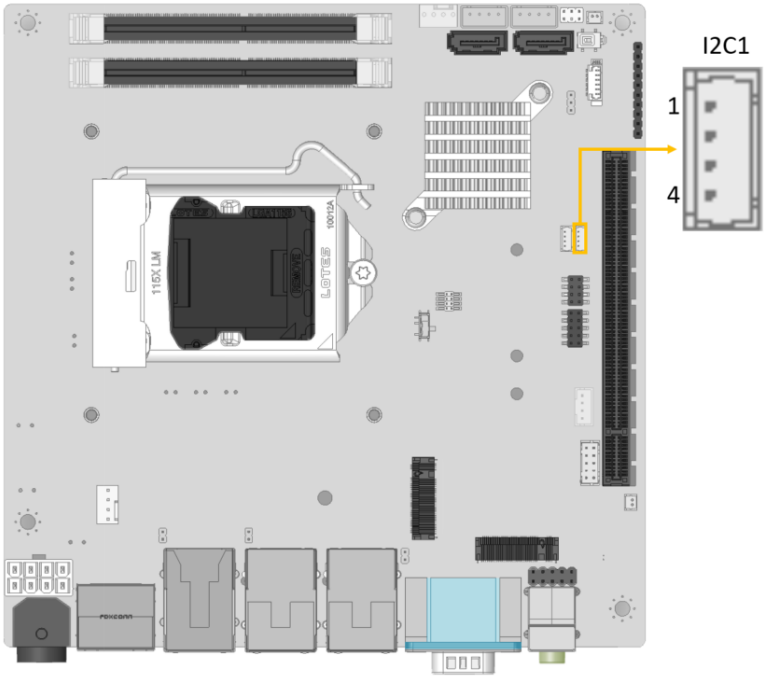


Figure 3-10: I²C Connector Location

Pin	Description
1	GND
2	I2C_DATA
3	I2C_CLK
4	+5V

Table 3-10: I²C Connector Pinouts

3.2.10 Internal Power Connector

CN Label: **PWR2**

CN Type: 8-pin Molex power connector, p=4.2 mm

CN Location: See **Figure 3-11**

CN Pinouts: See **Table 3-11**

This connector provides power to the system.

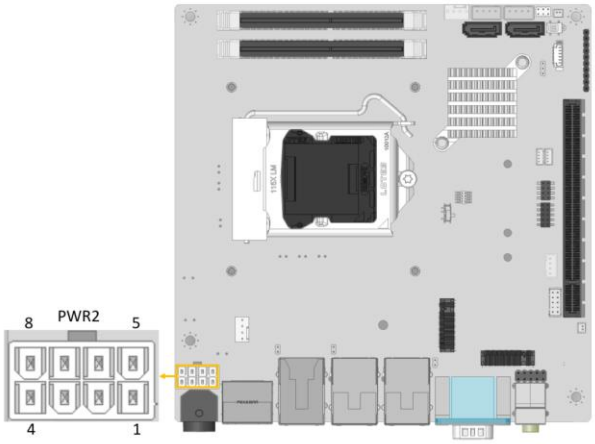


Figure 3-11: Internal Power Connector Pinout Location

Pin	Description	Pin	Description
1	GND	5	+12V
2	GND	6	+12V
3	GND	7	+12V
4	GND	8	+12V

Table 3-11: Internal Power Connector Pinouts

3.2.11 LAN LED Connectors

CN Label:	**JP1, JP2, JP3**
CN Type:	2-pin header, p=2.0 mm
CN Location:	See **Figure 3-12**
CN Pinouts:	See **Table 3-12**

The LAN LED connectors are used to connect to the LAN LED indicators on the chassis to indicate users the link activities of the three LAN ports.

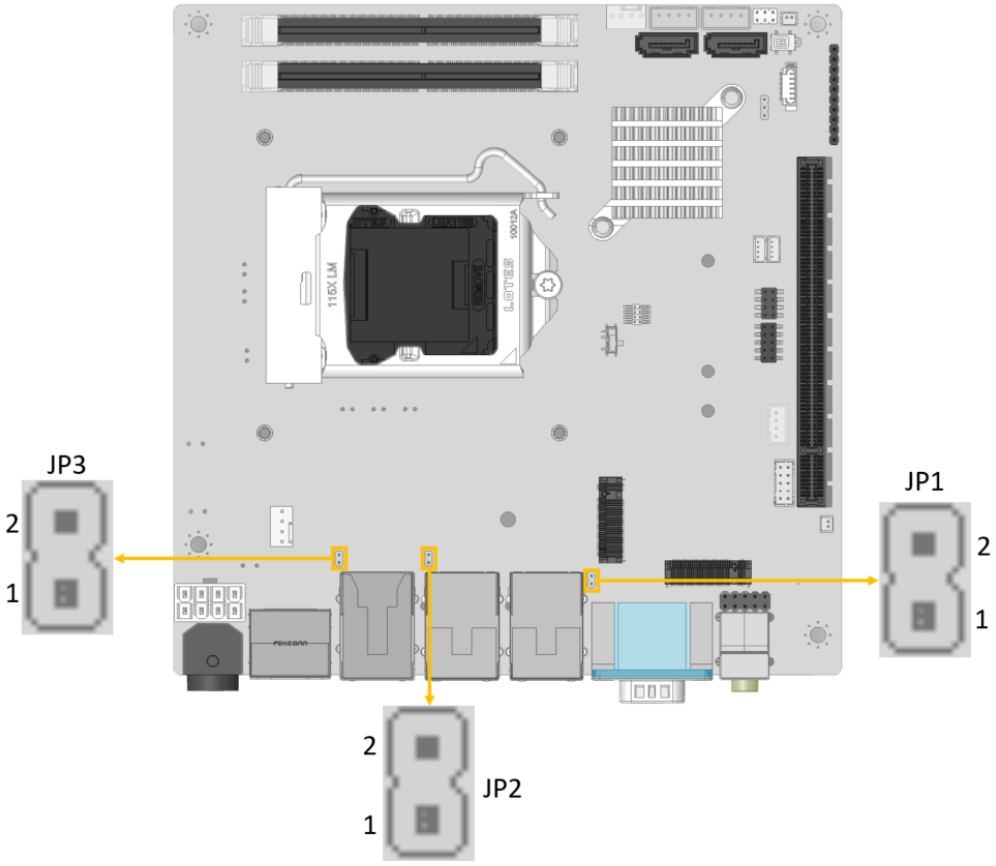


Figure 3-12: LAN LED Connector Locations

Pin	Description
1	+3.3V
2	LAN_LED_LINK#_ACT

Table 3-12: LAN LED Connector Pinouts

3.2.12 M.2 Slot, A-key

CN Label: **M2_A1**

CN Type: M.2 A-key slot

CN Location: See **Figure 3-13**

CN Pinouts: See **Table 3-13**

The M.2 slot is keyed in the A position and accepts 2230 size of M.2 modules. The M.2 slot supports PCIe x1 and USB 2.0 signals.

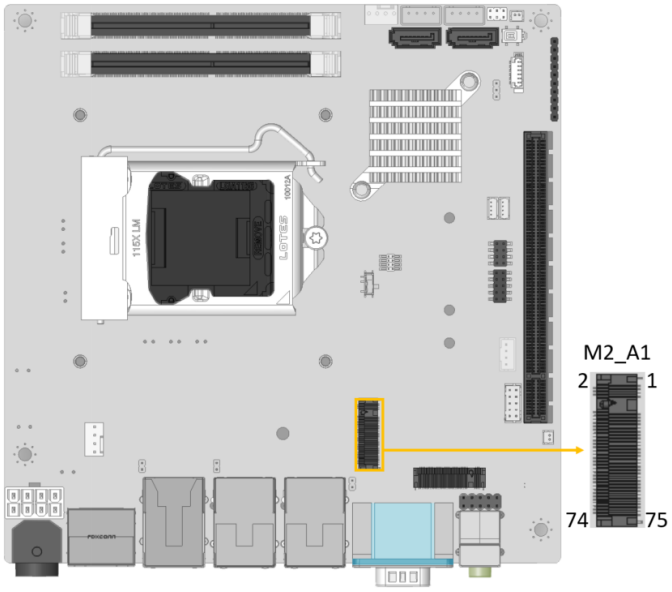


Figure 3-13: M.2 A-key Slot Location

Pin	Description	Pin	Description
1	GND	2	+3.3V
3	USB+	4	+3.3V
5	USB-	6	NC
7	GND	8	Module Key
9	Module Key	10	Module Key
11	Module Key	12	Module Key
13	Module Key	14	Module Key
15	Module Key	16	NC

Pin	Description	Pin	Description
17	NC	18	GND
19	NC	20	NC
21	NC	22	NC
23	GND	24	GND
25	NC	26	NC
27	NC	28	NC
29	GND	30	GND
31	NC	32	NC
33	GND	34	NC
35	PCIE_TX+	36	GND
37	PCIE_TX-	38	NC
39	GND	40	NC
41	PCIE_RX+	42	NC
43	PCIE_RX1	44	NC
45	GND	46	NC
47	PCIE_CLK+	48	NC
49	PCIE_CLK-	50	NC
51	GND	52	PLT_RST
53	CLKREQ0#	54	Pull up +3.3V
55	PCIE_WAKE	56	Pull up +3.3V
57	GND	58	NC
59	NC	60	NC
61	NC	62	NC
63	GND	64	NC
65	NC	66	NC
67	NC	68	NC
69	GND	70	NC
71	NC	72	+3.3V
73	NC	74	+3.3V
75	GND		

Table 3-13: M.2 A-Key Slot Pinouts

3.2.13 M.2 Slot, B-key

CN Label: **M2_B1**

CN Type: M.2 B-key slot

CN Location: See **Figure 3-14**

CN Pinouts: See **Table 3-14**

The M.2 slot is keyed in the B position and accepts 3042/3052/2242/2280 size of M.2 modules. The M.2 slot supports PCIe x2 and USB 2.0 signals.

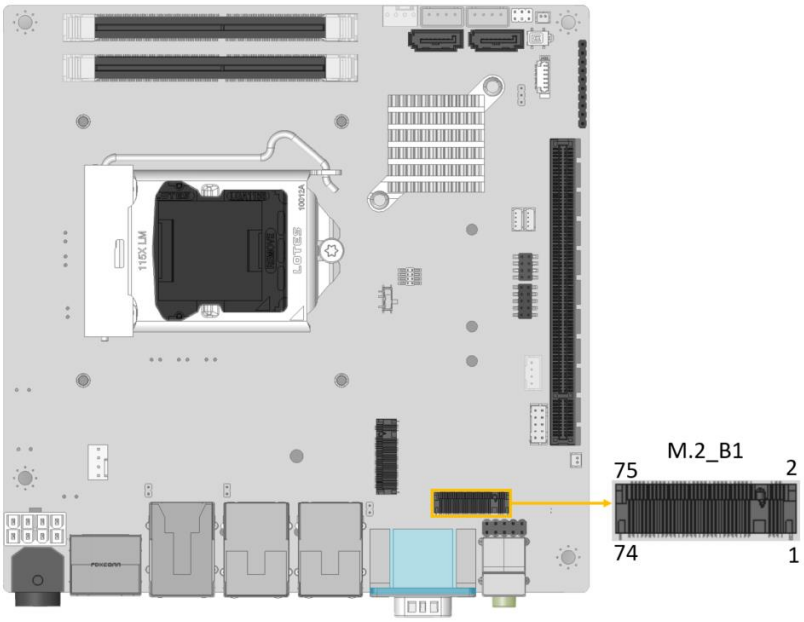


Figure 3-14: M.2 B-key Slot Location

Pin	Description	Pin	Description
1	GND	2	+3.3V
3	GND	4	+3.3V
5	GND	6	NC
7	USB+	8	NC
9	USB-	10	NC
11	GND	12	Module Key
13	Module Key	14	Module Key

Pin	Description	Pin	Description
15	Module Key	16	Module Key
17	Module Key	18	Module Key
19	Module Key	20	NC
21	NC	22	NC
23	PCH_WAKE_N	24	NC
25	DPR	26	NC
27	GND	28	NC
29	PCIE_RX1-	30	SIM_RST
31	PCIE_RX1+	32	SIM_CLK
33	GND	34	SIM_IO
35	PCIE_TX1-	36	SIM_VCC
37	PCIE_TX1+	38	NC
39	GND	40	NC
41	PCIE_RX0-	42	NC
43	PCIE_RX0+	44	NC
45	GND	46	NC
47	PCIE_TX0-	48	NC
49	PCIE_TX0+	50	M2_RST
51	GND	52	CLKREQ0#
53	PCIECLK-	54	PCH_WAKE_N
55	PCIECLK+	56	NC
57	GND	58	NC
59	NC	60	NC
61	NC	62	NC
63	NC	64	NC
65	NC	66	NC
67	LTE_RST	68	NC
69	PEDET	70	+3.3V
71	GND	72	+3.3V
73	GND	74	+3.3V
75	GND		

Table 3-14: M.2 B-Key Slot Pinouts

3.2.14 PCIe x16 Slot

CN Label: **PCIEX16_1**

CN Type: PCIe x16 slot

CN Location: See **Figure 3-15**

The PCIe x16 expansion card slot is for PCIe x16 expansion card.

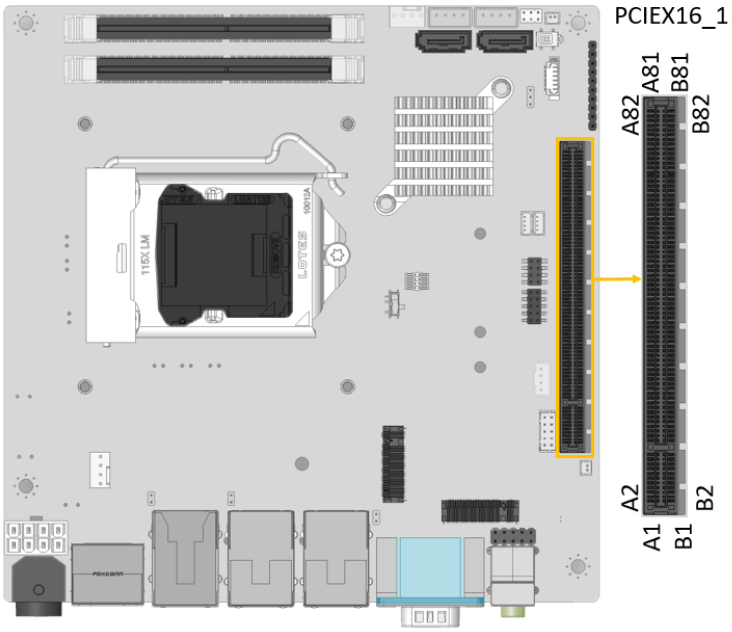


Figure 3-15: PCIe x16 Slot Location

3.2.15 RS-232 Serial Port Connector

CN Label: **COM3**

CN Type: 10-pin header, p=2.00 mm

CN Location: See **Figure 3-16**

CN Pinouts: See **Table 3-15**

Each of these connectors provides RS-232 connections.

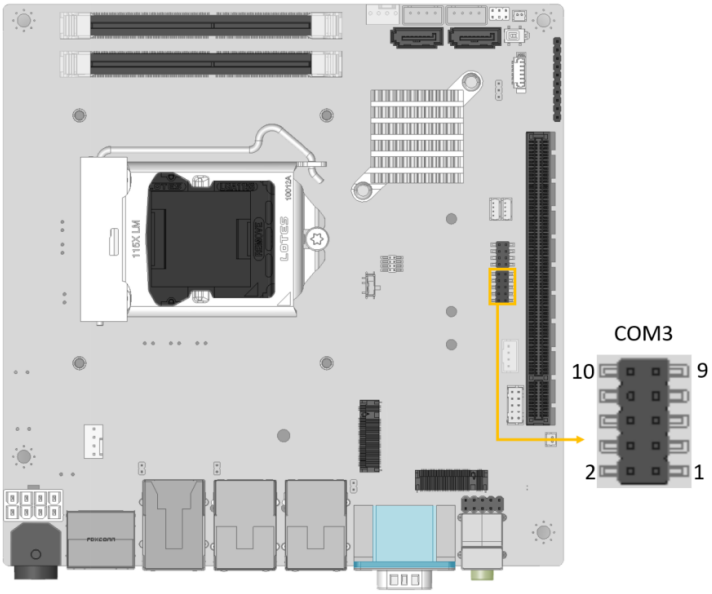


Figure 3-16: RS-232 Serial Port Connector Location

Pin	Description	Pin	Description
1	DCD	2	DSR
3	RXD	4	RTS
5	TXD	6	CTS
7	DTR	8	RI
9	GND	10	GND

Table 3-15: RS-232 Serial Port Connector Pinouts

3.2.16 RS-422/485 Serial Port Connector

CN Label: **COM4**

CN Type: 4-pin wafer, p=2.00 mm

CN Location: See **Figure 3-17**

CN Pinouts: See **Table 3-16** and **Table 3-17**

This connector provides RS-422 or RS-485 communications.

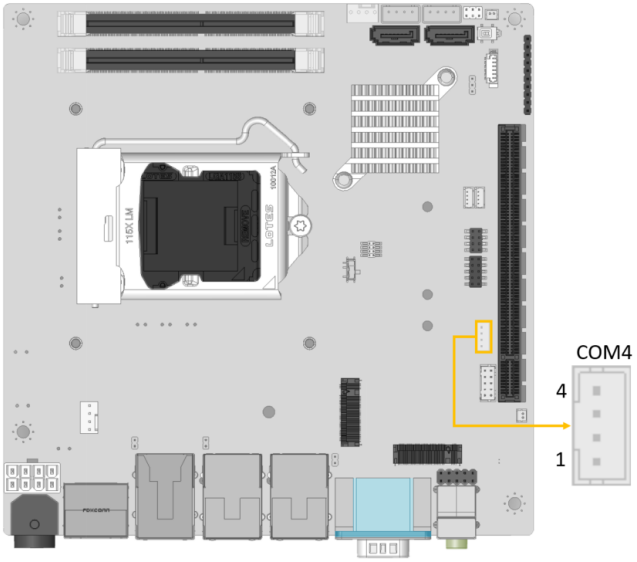


Figure 3-17: RS-422/485 Connector Location

Pin	Description
1	RXD422-
2	RXD422+
3	TXD422+/TXD485+
4	TXD422-/TXD485-

Table 3-16: RS-422/485 Connector Pinouts

Use the optional RS-422/485 cable to connect to a serial device. The pinouts of the DB-9 connector are listed below.

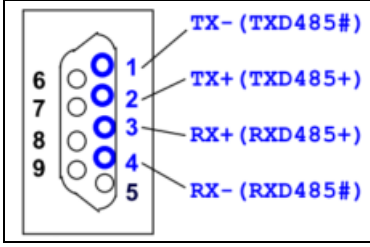
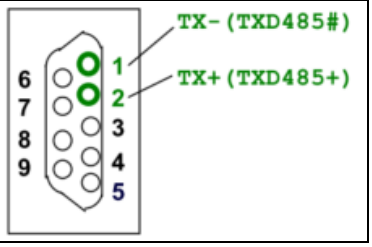
RS-422 Pinouts	RS-485 Pinouts
	

Table 3-17: DB-9 RS-422/485 Pinouts

3.2.17 SATA 6Gb/s Drive Connectors

CN Label:	**S_ATA1, S_ATA2**
CN Type:	7-pin SATA drive connector
CN Location:	See **Figure 3-18**
CN Pinouts:	See **Table 3-18**

The SATA drive connectors can be connected to SATA drives and supports up to 6Gb/s data transfer rate.

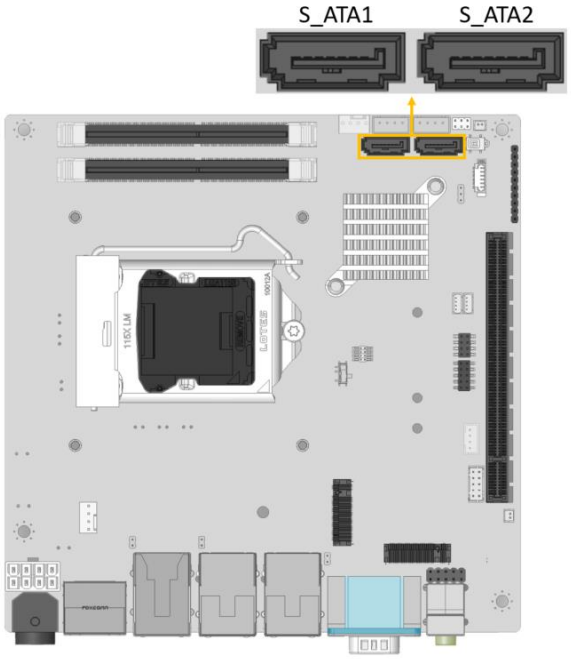


Figure 3-18: SATA 6Gb/s Drive Connector Locations

Pin	Description	Pin	Description
1	GND	2	SATA_TX+
3	SATA_TX-	4	GND
5	SATA_RX-	6	SATA_RX+
7	GND	8	NC

Table 3-18: SATA 6Gb/s Drive Connector Pinouts

3.2.18 SATA Power Connectors

CN Label:	**SATA_PWR1, SATA_PWR2**
CN Type:	4-pin wafer
CN Location:	See **Figure 3-19**
CN Pinouts:	See **Table 3-19**

Use the SATA Power Connector to connect to SATA device power connections.

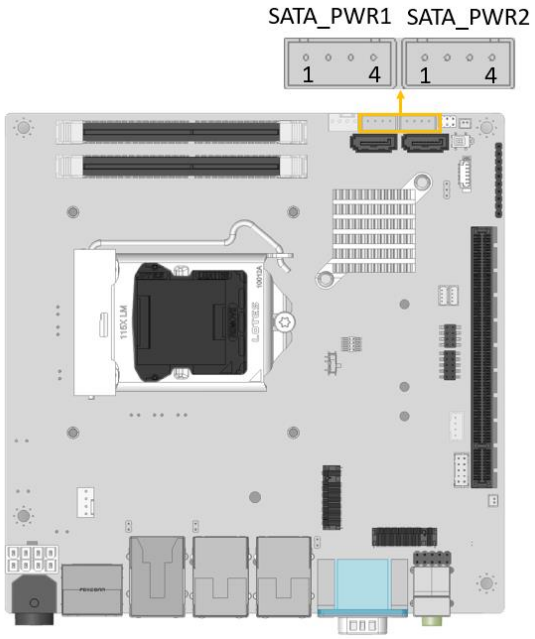


Figure 3-19: SATA Power Connector Locations

Pin	Description
1	+12V
2	GND
3	GND
4	+5V

Table 3-19: SATA Power Connector Pinouts

3.2.19 SMBus Connector

CN Label: **SMB1**

CN Type: 4-pin wafer, p=1.25 mm

CN Location: See **Figure 3-20**

CN Pinouts: See **Table 3-**

The SMBus (System Management Bus) connector provides low-speed system management communications.

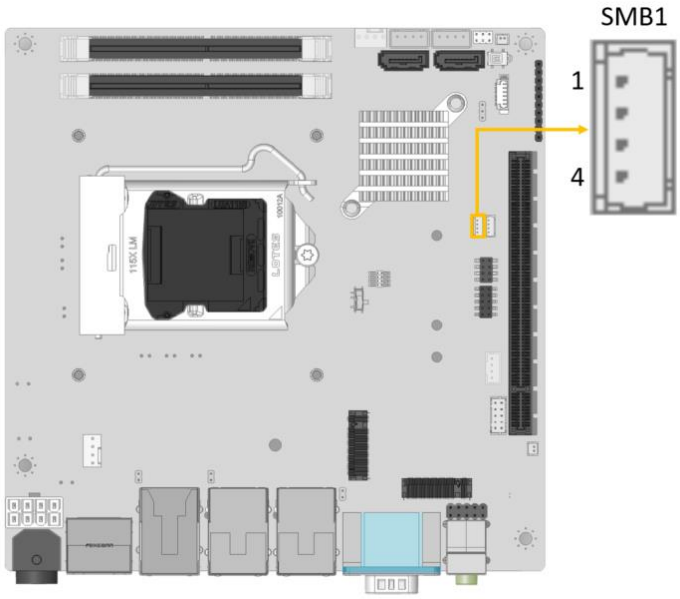


Figure 3-20: SMBus Connector Location

Pin	Description
1	GND
2	SMB_DATA
3	SMB_CLK
4	+5V

Table 3-20: SMBus Connector Pinouts

3.2.20 SPI Flash Connector

CN Label:	**JSPI1**
CN Type:	6-pin wafer, p=1.25 mm
CN Location:	See **Figure 3-21**
CN Pinouts:	See **Table 3-20**

The SPI flash connector is used to flash the SPI ROM.

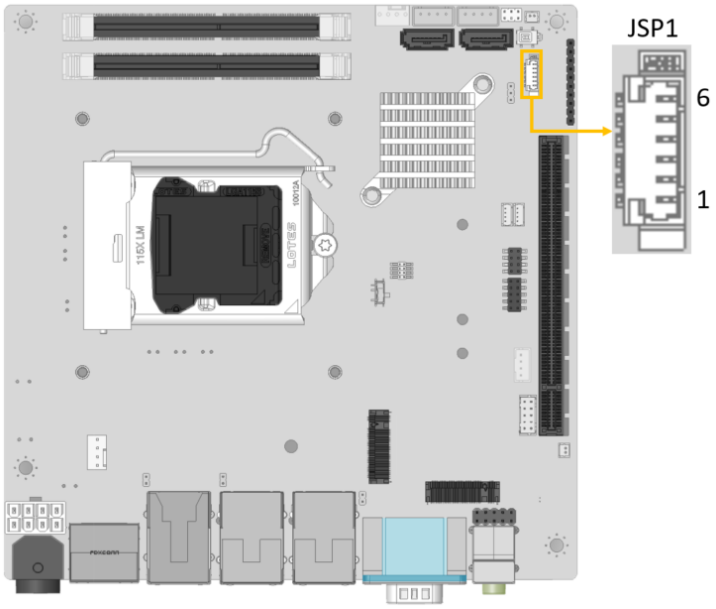


Figure 3-21: SPI Flash Connector Location

Pin	Description
1	+3.3V
2	SPI_CS#
3	SPI_SO
4	SPI_CLK
5	SPI_SI
6	GND

Table 3-20: SPI Flash Connector Pinouts

3.2.21 SPI Flash Connector, EC

CN Label: **EC_SPI1**

CN Type: 8-pin wafer, p=1.25 mm

CN Location: See **Figure 3-22**

CN Pinouts: See **Table 3-21**

The SPI flash connector is used to flash the EC ROM.

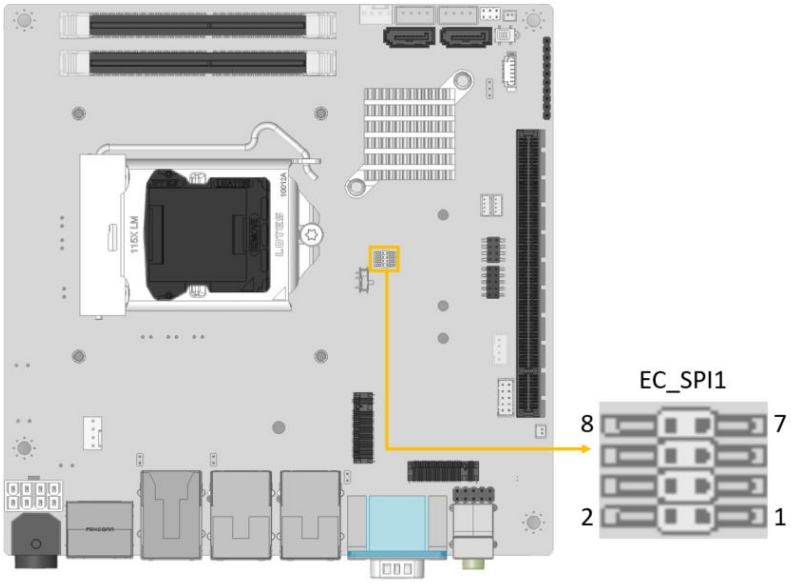


Figure 3-22: SPI EC Flash Connector Location

Pin	Description
1	CS#_EC
2	VCC
3	SPI_SO_EC
4	SPI_HOLD_EC
5	SPI_EC_GPG
6	SPI_SCK_EC
7	GED
8	SPI_SIO_EC

Table 3-21: SPI EC Flash Connector Pinouts

3.2.22 USB 2.0 Connectors

CN Label: **USB2**

CN Type: 8-pin header, p=2.00 mm

CN Location: See **Figure 3-23**

CN Pinouts: See **Table 3-22**

The USB 2.0 connectors connect to USB 2.0/1.1 devices. Each pin header provides two USB 2.0 ports.

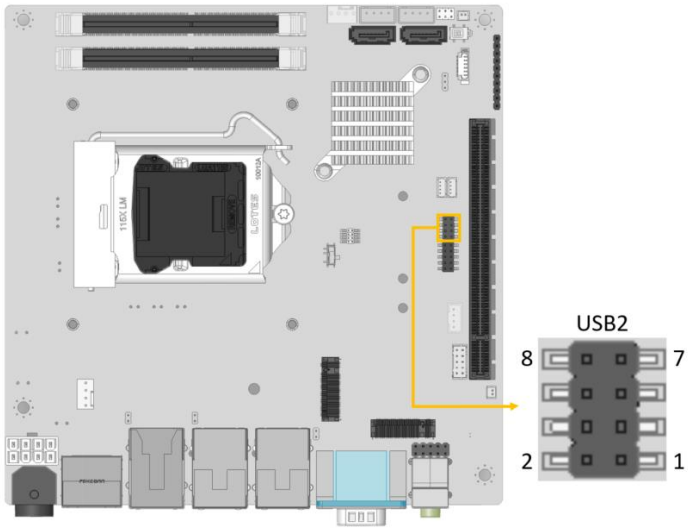


Figure 3-23: USB 2.0 Connector Locations

Pin	Description	Pin	Description
1	VCC	2	GND
3	DATA-	4	DATA+
5	DATA+	6	DATA-
7	GND	8	VCC

Table 3-22: USB 2.0 Connector Pinouts

3.3 External Peripheral Interface Connector Panel

The figure below shows the external peripheral interface connector (EPIC) panel. The EPIC panel consists of the following:

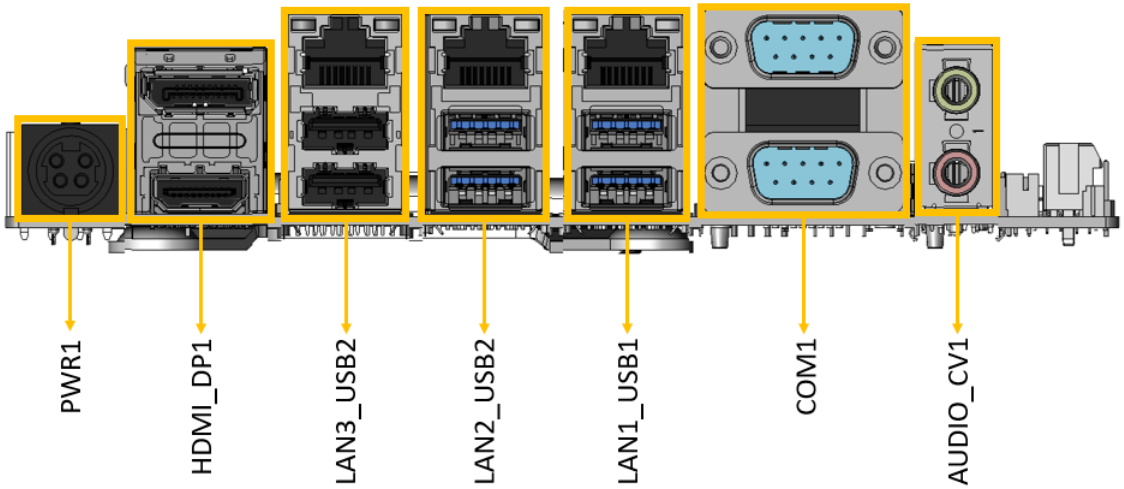


Figure 3-24: External Peripheral Interface Connector

3.3.1 Audio Connector

CN Label:	**AUDIO_CV1**
CN Type:	Audio jack
CN Location:	See **Figure 3-25**

The audio jacks connect to external audio devices.

- **Line Out port (Lime):** Connects to a headphone or a speaker. With multi-channel configurations, this port can also connect to front speakers.
- **Microphone (Pink):** Connects a microphone.

Figure 3-25: Audio Connector

3.3.2 Ethernet and USB 3.2 Gen1 Connectors

CN Label:	**LAN1_USB1, LAN2_USB2**
CN Type:	RJ-45 and USB 3.2 Gen1 combo
CN Location:	See **Figure 3-26** and **Figure 3-27**
CN Pinouts:	See **Table 3-23** and **Table 3-24**

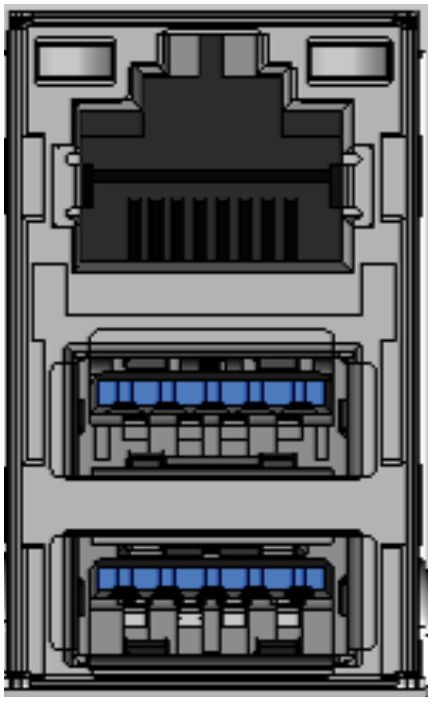


Figure 3-26: USB 3.2 Gen1 and LAN Connector

There are four external USB 3.2 Gen1 (5Gb/s) connectors on the KINO-DH420.

Pin	Description	Pin	Description
1	VCC	10	VCC
2	USB_DATA-	11	USB_DATA-
3	USB_DATA+	12	USB_ DATA+
4	GND	13	GND
5	USB3_RX-	14	USB3_RX-
6	USB3_RX+	15	USB3_ RX+
7	GND	16	GND
8	USB3_TX-	17	USB3_TX-
9	USB3_TX+	18	USB3_TX+

Table 3-23: USB 3.2 Gen1 Port Pinouts

Each LAN connector connects to a local network.

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	MDIA3-	5	MDIA1+
2	MDIA3+	6	MDIA2+
3	MDIA2-	7	MDIA0-
4	MDIA1-	8	MDIA0+

Table 3-24: LAN Port Pinouts

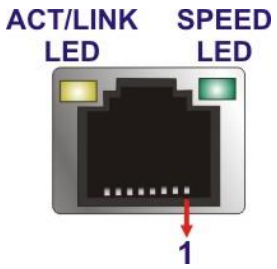


Figure 3-27: LAN Connector

3.3.3 Ethernet and USB 2.0 Connectors

CN Label: **LAN3_USB2**

CN Type: RJ-45 and USB 2.0 combo

CN Location: See **Figure 3-28**

CN Pinouts: See **Table 3-25**

There are two external USB 2.0 connectors on the KINO-DH420.

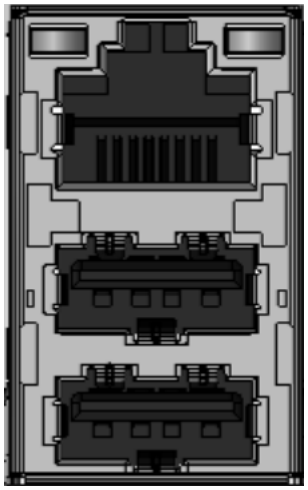


Figure 3-28: Ethernet and USB 2.0 Connector

Pin	Description	Pin	Description
1	VCC	5	VCC
2	USB_DATA-	6	USB_DATA-
3	USB_DATA+	7	USB_ DATA+
4	GND	8	GND

Table 3-25: USB 3.2 Gen1 Port Pinouts

3.3.4 DP and HDMI Connectors

CN Label: **HDMI_DP1**

CN Type: HDMI and DP

CN Location: See **Figure 3-29** and **Figure 3-30**

CN Pinouts: See **Table 3-26** and **Table 3-27**

The KINO-DH420 has one HDMI and one DP port. They can connect to HDMI and DP devices.

The HDMI connector can connect to an HDMI device.

Pin	Description	Pin	Description
21	HDMI_DATA2	31	GND
22	GND	32	HDMI_CLK#
23	HDMI_DATA2#	33	N/C
24	HDMI_DATA1	34	N/C
25	GND	35	HDMI_SCL
26	HDMI_DATA1#	36	HDMI_SDA
27	HDMI_DATA0	37	GND
28	GND	38	+5V
29	HDMI_DATA0#	39	HDMI_HPD
30	HDMI_CLK		

Table 3-26: HDMI Connector Pinouts

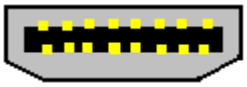


Figure 3-29: HDMI Connector

The DP connector connects to a display device with DisplayPort interface.

Pin	Description	Pin	Description
1	LANE0P	11	GND
2	GND	12	LANE3N
3	LANE0N	13	AUX_CTRL_DET_C
4	LANE1P	14	GND
5	LANE1N	15	AUXP
6	GND	16	GND
7	LANE2P	17	AUXN

Pin	Description	Pin	Description
8	GND	18	HPD
9	LANE2N	19	GND
10	LANE3P	20	+5V

Table 3-27: DP Connector Pinouts

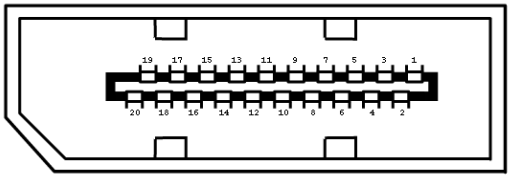


Figure 3-30: DP Connector

3.3.5 Power Connector (for Power Adapter)

CN Label: **PWR1**

CN Type: 4-pin Mini-DIN

CN Location: See **Figure 3-31**

CN Pinouts: See **Figure 3-31**

The external power connector supports power adapter.

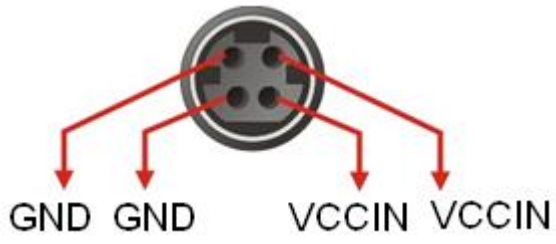


Figure 3-31: 4-pin Power Mini-DIN Connector

3.3.6 RS-232 Connectors

CN Label: **COM1, COM2**

CN Type: DB-9 male

CN Location: See **Figure 3-32**

CN Pinouts: See **Table 3-28**

The COM connectors (COM1and COM2) connect to a serial device that supports RS-232 communication.

Pin	Description	Pin	Description
1	DCD	6	DSR
2	RXD	7	RTS
3	TXD	8	CTS
4	DTR	9	RI
5	GND		

Table 3-28: Connector Pinouts

Figure 3-32: Serial Port Pinout Locations

Chapter

4

Installation

4.1 Anti-static Precautions

WARNING:

Failure to take ESD precautions during the installation of the KINO-DH420 may result in permanent damage to the KINO-DH420 and severe injury to the user.

Electrostatic discharge (ESD) can cause serious damage to electronic components, including the KINO-DH420. Dry climates are especially susceptible to ESD. It is therefore critical that whenever the KINO-DH420 or any other electrical component is handled, the following anti-static precautions are strictly adhered to.

- ***Wear an anti-static wristband***: - Wearing a simple anti-static wristband can help to prevent ESD from damaging the board.
- ***Self-grounding***:- Before handling the board touch any grounded conducting material. During the time the board is handled, frequently touch any conducting materials that are connected to the ground.
- ***Use an anti-static pad***: When configuring the KINO-DH420, place it on an anti-static pad. This reduces the possibility of ESD damaging the KINO-DH420.
- ***Only handle the edges of the PCB***:-: When handling the PCB, hold the PCB by the edges.

4.2 Installation Considerations

NOTE:

The following installation notices and installation considerations should be read and understood before installation. All installation notices must be strictly adhered to. Failing to adhere to these precautions may lead to severe damage and injury to the person performing the installation.

WARNING:

The installation instructions described in this manual should be carefully followed in order to prevent damage to the components and injury to the user.

Before and during the installation please **DO** the following:

- Read the user manual:
  - The user manual provides a complete description of the KINO-DH420 installation instructions and configuration options.
- Wear an electrostatic discharge cuff (ESD):
  - Electronic components are easily damaged by ESD. Wearing an ESD cuff removes ESD from the body and helps prevent ESD damage.
- Place the KINO-DH420 on an anti-static pad:
  - When installing or configuring the motherboard, place it on an anti-static pad. This helps to prevent potential ESD damage.
- Turn all power to the KINO-DH420 off:
  - When working with the KINO-DH420, make sure that it is disconnected from all power supplies and that no electricity is being fed into the system.

Before and during the installation of the KINO-DH420, **DO NOT:**

- Remove any of the stickers on the PCB board. These stickers are required for warranty validation.
- Use the product before verifying all the cables and power connectors are properly connected.
- Allow screws to come in contact with the PCB circuit, connector pins, or its components.

4.3 Socket LGA1200 CPU Installation

WARNING:

CPUs are expensive and sensitive components. When installing the CPU please be careful not to damage it in anyway. Make sure the CPU is installed properly and ensure the correct cooling kit is properly installed.

DO NOT touch the pins at the bottom of the CPU. When handling the CPU, only hold it on the sides.

To install the CPU, follow the steps below.

Step 1: **Disengage the load lever** by pressing the lever down and slightly outward to clear the retention tab. Fully open the lever. See **Figure 4-1**.

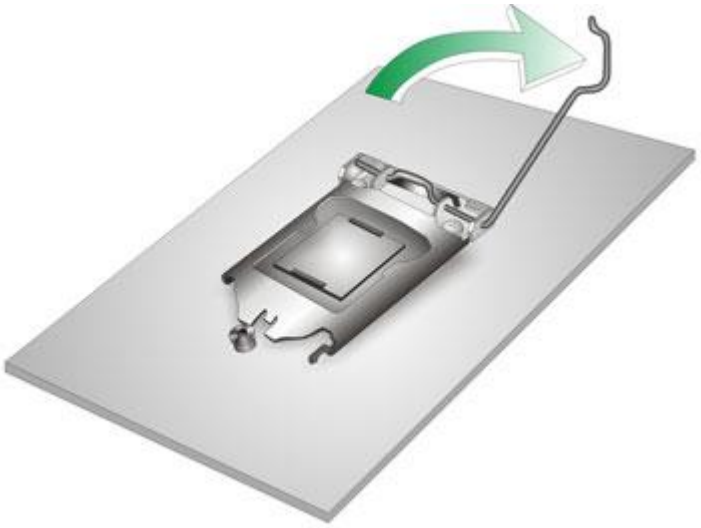


Figure 4-1: Disengage the CPU Socket Load Lever

Step 2: **Open the socket and remove the protective cover.** The black protective cover can be removed by pulling up on the tab labeled "Remove". See **Figure 4-2**.

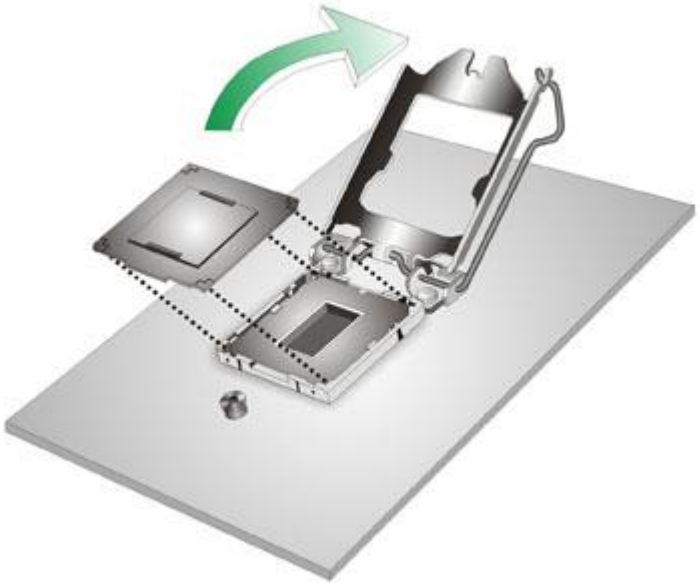


Figure 4-2: Remove Protective Cover

Step 3: **Inspect the CPU socket.** Make sure there are no bent pins and make sure the socket contacts are free of foreign material. If any debris is found, remove it with compressed air.

Step 4: **Orientate the CPU properly.** The contact array should be facing the CPU socket.

WARNING:

DO NOT touch the pins at the bottom of the CPU. When handling the CPU, only hold it on the sides.

Step 5: **Correctly position the CPU.** Match the Pin 1 mark with the cut edge on the CPU socket.

Step 6: **Align the CPU pins.** Locate pin 1 and the two orientation notches on the CPU. Carefully match the two orientation notches on the CPU with the socket alignment keys.

Step 7: **Insert the CPU.** Gently insert the CPU into the socket. If the CPU pins are properly aligned, the CPU should slide into the CPU socket smoothly. See **Figure 4-3**.

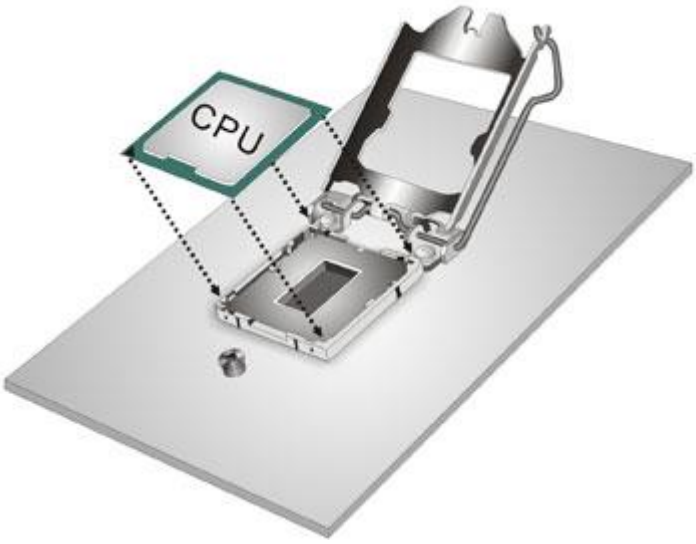


Figure 4-3: Insert the Socket LGA1151 CPU

Step 8: **Close the CPU socket.** Close the load plate and pull the load lever back a little to have the load plate be able to secure to the knob. Engage the load lever by pushing it back to its original position (**Figure 4-4**). There will be some resistance, but will not require extreme pressure.

Figure 4-4: Close the Socket LGA1151

4.4 Socket LGA1200 Cooling Kit Installation

WARNING:

DO NOT attempt to install a push-pin cooling fan.

The pre-installed support bracket prevents the board from bending and is ONLY compatible with captive screw type cooling fans.

The cooling kit can be bought from IEI. The cooling kit has a heat sink and fan.

WARNING:

Do not wipe off (accidentally or otherwise) the pre-sprayed layer of thermal paste on the bottom of the heat sink. The thermal paste between the CPU and the heat sink is important for optimum heat dissipation.

To install the cooling kit, follow the instructions below.

Step 1: A cooling kit bracket is pre-installed on the rear of the motherboard. See **Figure 4-5.**

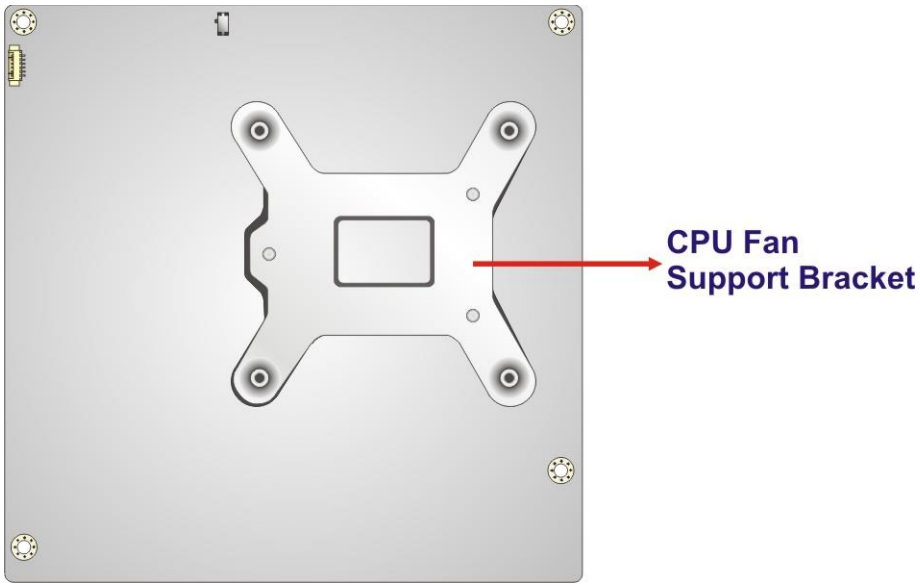


Figure 4-5: Cooling Kit Support Bracket

Step 2: **Place the cooling kit onto the socket LGA1200 CPU**. Make sure the CPU cable can be properly routed when the cooling kit is installed.

Step 3: **Mount the cooling kit**. Gently place the cooling kit on top of the CPU. Make sure the four threaded screws on the corners of the cooling kit properly pass through the holes of the cooling kit bracket.

Step 4: **Tighten the screws**. Use a screwdriver to tighten the four screws. In a diagonal pattern, tighten each screw a few turns then move to the next one, until they are all secured. Do not overtighten the screws.

Step 5: **Connect the fan cable**. Connect the cooling kit fan cable to the CPU fan connector on the KINO-DH420. Carefully route the cable and avoid heat generating chips and fan blades.

4.5 SO-DIMM Installation

CAUTION:

For dual channel configuration, always install two identical memory modules that feature the same capacity, timings, voltage, number of ranks and the same brand.

To install a SO-DIMM, please follow the steps below and refer to Figure 4-6.

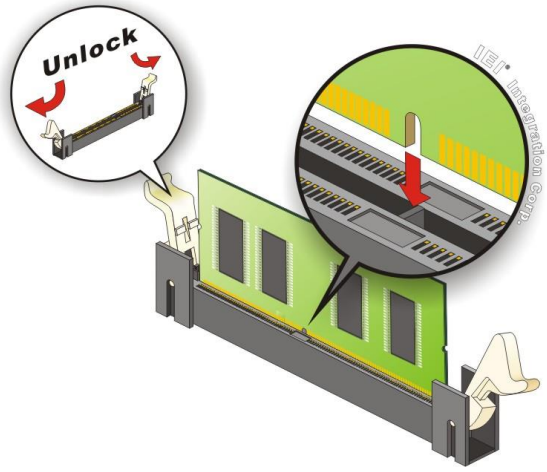


Figure 4-6: SO-DIMM Installation (DDR4)

Step 1: **Open the SO-DIMM socket handles**. Open the two handles outwards as far as they can. See Figure 4-6.

Step 2: **Align the SO-DIMM with the socket**. Align the SO-DIMM so the notch on the memory lines up with the notch on the memory socket. See Figure 4-6.

Step 3: **Insert the SO-DIMM**. Once aligned, press down until the SO-DIMM is properly seated. Clip the two handles into place. See Figure 4-6.

Step 4: **Removing a SO-DIMM**. To remove a SO-DIMM, push both handles outward. The memory module is ejected by a mechanism in the socket.

4.6 M.2 Module Installation

To install an M.2 module, please follow the steps below.

Step 1: Locate the M.2 module slot. See **Chapter 3**. Remove the on-board retention screw.

Step 2: Line up the notch on the module with the notch on the slot. Slide the M.2 module into the socket at an angle of about 20º (**Figure 4-7**).

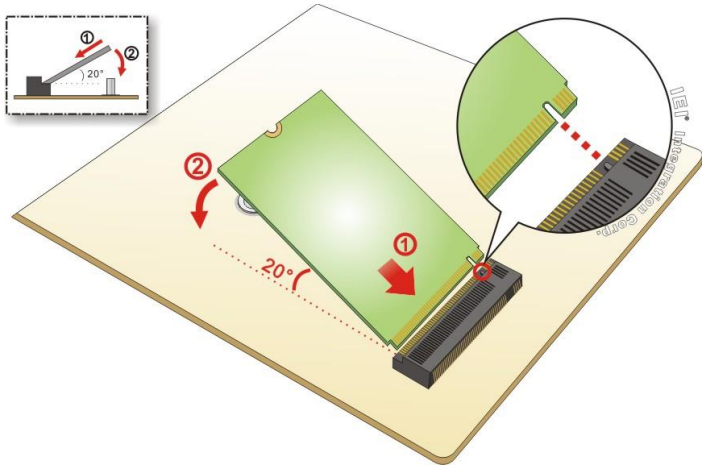


Figure 4-7: Inserting the M.2 Module into the Slot at an Angle

Step 3: Secure the M.2 module with an M2*3 retention screw (**Figure 4-8**).

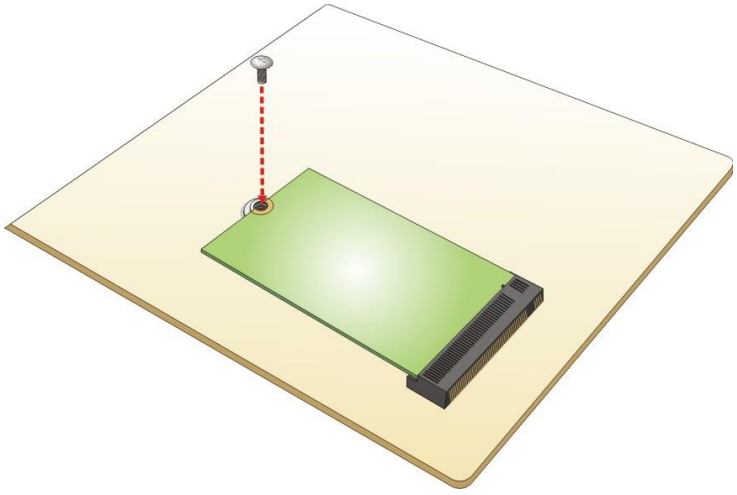


Figure 4-8: Securing the M.2 Module

4.7 System Configuration

The system configuration should be performed before installation.

4.7.1 AT/ATX Power Mode Setting

The AT and ATX power mode selection is made through the AT/ATX power mode switch which is shown in **Figure 4-9**.

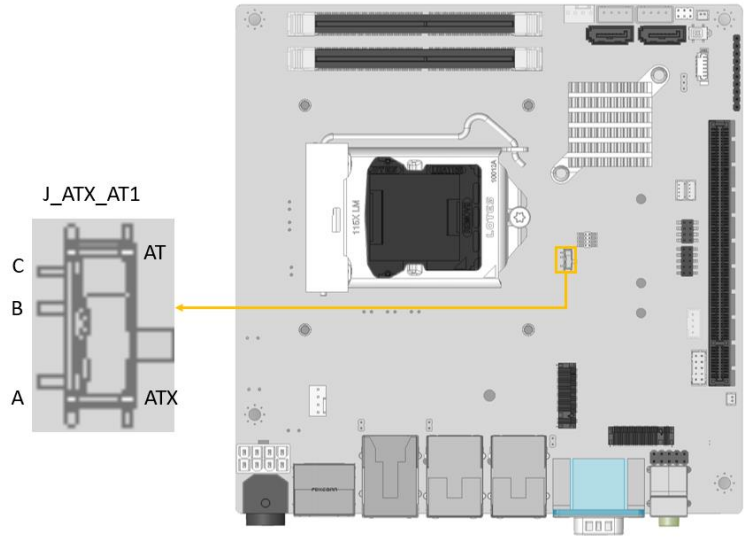


Figure 4-9: AT/ATX Power Mode Switch Location

Setting	Description
Short A-B	ATX power mode (default)
Short B-C	AT power mode

Table 4-1: AT/ATX Power Mode Switch Settings

4.7.2 Clear CMOS Button

To reset the BIOS, remove the on-board battery and press the clear CMOS button for three seconds or more. The clear CMOS button location is shown in **Figure 4-10**.

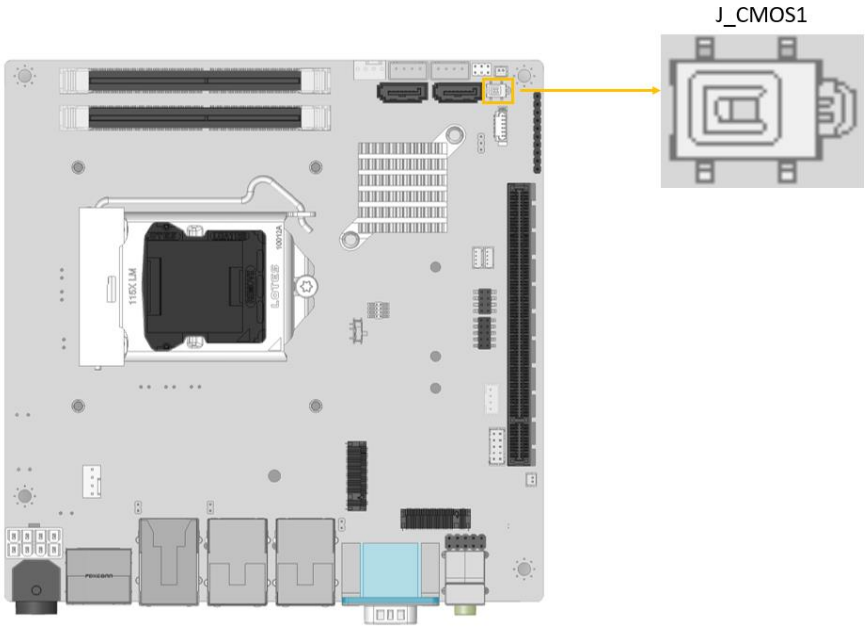


Figure 4-10: Clear CMOS Button Location

4.7.3 Flash Descriptor Security Override Jumper

The flash descriptor security override jumper (J_FLASH1) allows to enable or disable the ME firmware update. Refer to **Table 4-2** and **Figure 4-11** for the jumper location and settings.

Setting	Description
Short 1-2	Disabled
Short 2-3	Enabled

Table 4-2: Flash Descriptor Security Override Jumper Settings

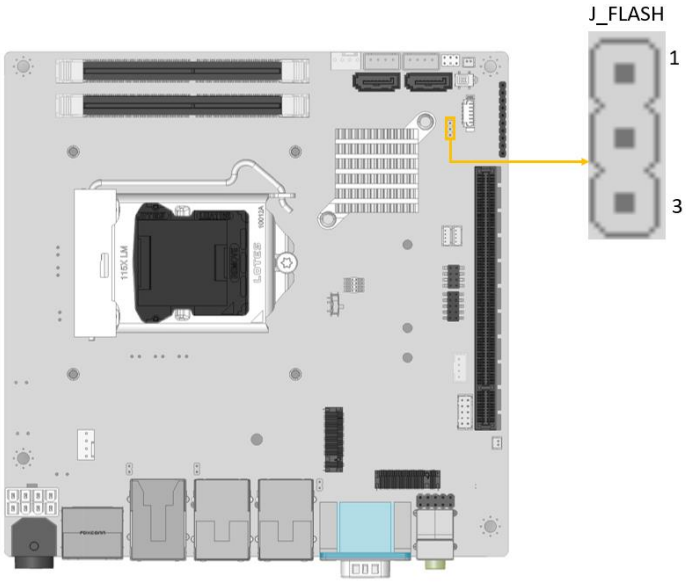


Figure 4-11: Flash Descriptor Security Override Jumper Location

To update the ME firmware, please follow the steps below.

Step 1: Before turning on the system power, short pin 2-3 of the flash descriptor security override jumper.

Step 2: Update the BIOS and ME firmware, and then turn off the system power.

Step 3: Remove the metal clip on the flash descriptor security override jumper or return to its default setting (short pin 1-2).

Step 4: Restart the system. The system will reboot 2 ~ 3 times to complete the ME firmware update.

4.7.4 USB Power Selection

The USB power selection is made through the BIOS menu in “Chipset → PCH-IO Configuration”. Use the **USB Power SW1** and the **USB Power SW2** BIOS options to

configure the correspondent USB ports (see **Table 4-3**) and refer to **Table 4-4** to select the USB power source.

BIOS Options	Configured USB Ports
USB Power SW1	LAN1_USB1 (external USB 3.2 Gen1 ports) LAN2_USB2 (external USB 3.2 Gen1 ports)
USB Power SW2	LAN3_USB2 (external USB 2.0 ports) USB2 (internal USB 2.0 ports)

Table 4-3: BIOS Options and Configured USB Ports

Options	Description
+5V DUAL	+5V dual (default)
+5V	+5V

Table 4-4: USB Power Source Setup

4.8 Internal Peripheral Device Connections

This section outlines the installation of peripheral devices to the onboard connectors.

4.8.1 SATA Drive Connection

The KINO-DH420 is shipped with a SATA drive cable. To connect the SATA drive to the connector, please follow the steps below.

Step 1: **Locate the SATA connector and the SATA power connector**. The locations of the connectors are shown in **Chapter 3**.

Step 2: **Insert the cable connector**. Insert the cable connector into the on-board SATA drive connector and the SATA power connector. See **Figure 4-12**.

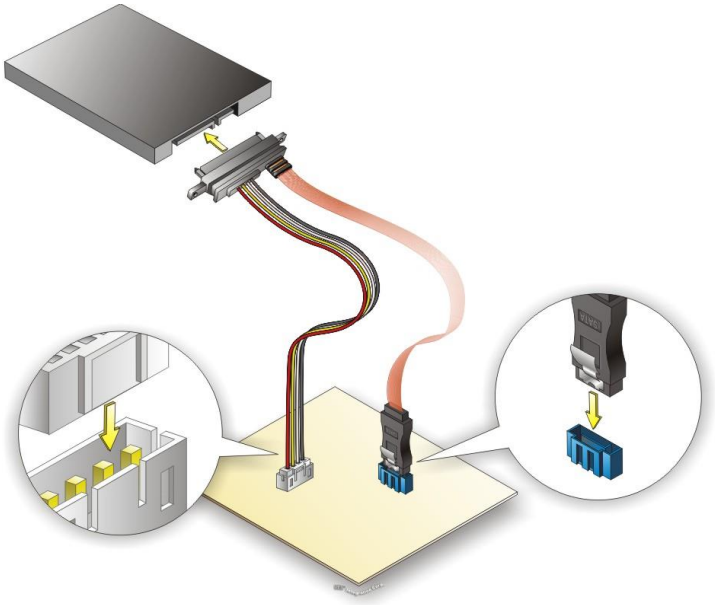


Figure 4-12: SATA Drive Cable Connection

Step 3: **Connect the cable to the SATA disk**. Connect the connector on the other end of the cable to the connector at the back of the SATA drive. See **Figure 4-12**.

Step 4: To remove the SATA cable from the SATA connector, press the clip on the connector at the end of the cable.

4.9 Available Drivers

All the drivers for the KINO-DH420 are available on IEI Resource Download Center (https://download.ieiworld.com). Type KINO-DH420 and press Enter to find all the relevant software, utilities, and documentation.

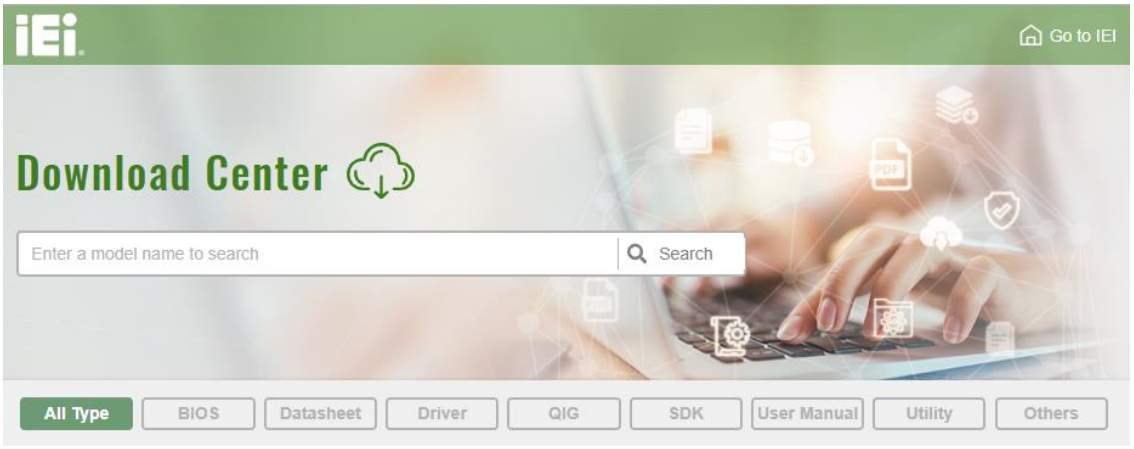
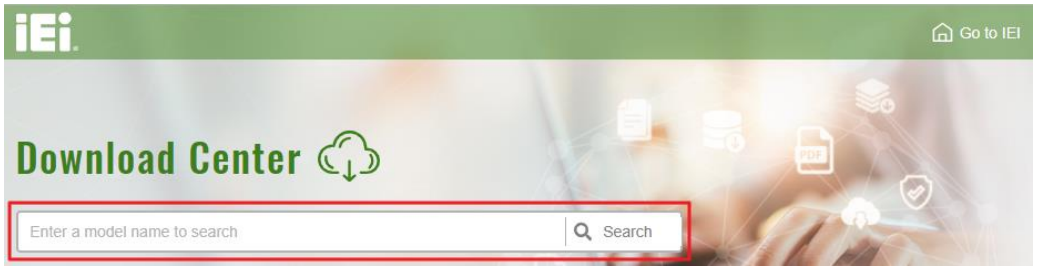


Figure 4-13: IEI Resource Download Center

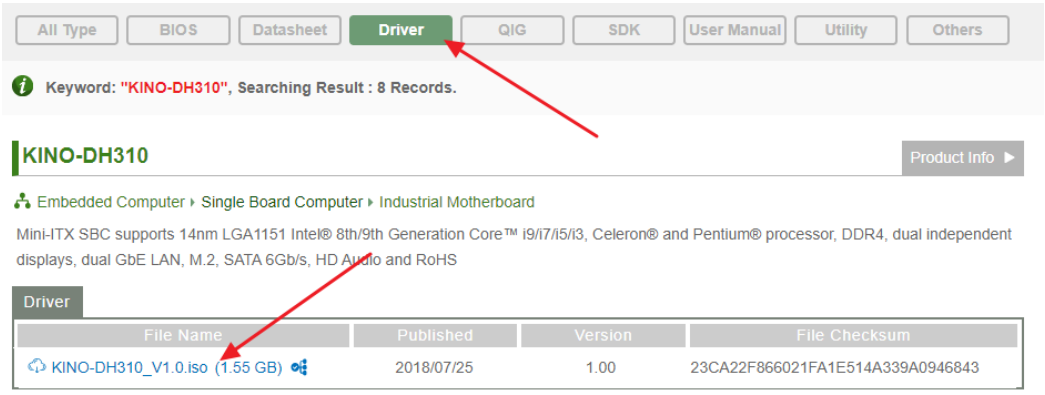
4.9.1 Driver Download

To download drivers from IEI Resource Download Center, follow the steps below.

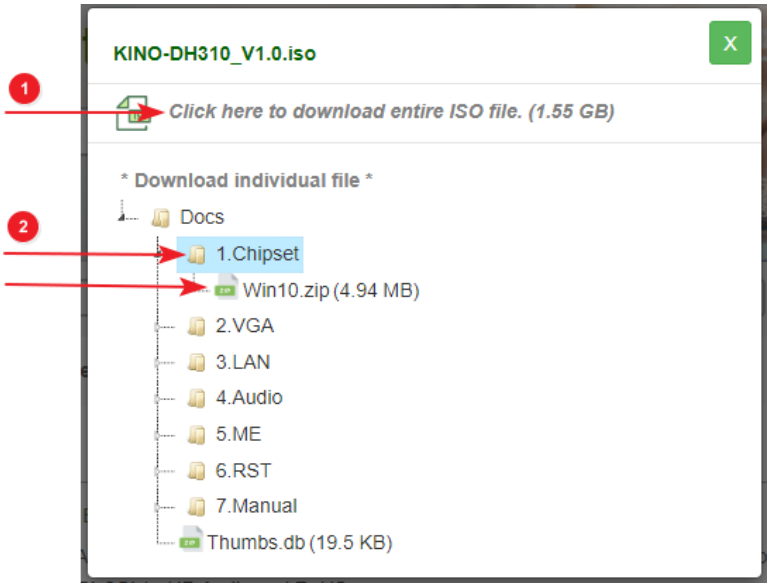
Step 1: Go to https://download.ieiworld.com. Type KINO-DH420 and press Enter.



Step 2: All product-related software, utilities, and documentation will be listed. You can choose **Driver** to filter the result.



Step 3: Click the driver file name on the page and you will be prompted with the following window. You can download the entire ISO file (❶), or double click an individual item to find its driver file and click the file name to download (❷).



NOTE:

To install software from the downloaded ISO image file in Windows 10, double-click the ISO file to mount it as a virtual drive to view its content.

4.10 Intel® AMT Setup Procedure

The KINO-DH420 is featured with the Intel® Active Management Technology (AMT). To enable the Intel® AMT function, follow the steps below.

Step 1: Make sure at least one of the memory sockets is installed with a DDR4 DIMM.

Step 2: Connect an Ethernet cable to the RJ-45 connector labeled **JP1**

Step 3: The AMI BIOS options regarding the Intel® ME or Intel® AMT must be enabled,

Step 4: Properly install the Intel® Management Engine Components drivers from the iAMT Driver & Utility directory in the driver CD.

Step 5: Configure the Intel® Management Engine BIOS extension (MEBx). To get into the Intel® MEBx settings, press <Ctrl+P> after a single beep during boot-up process. Enter the Intel® current ME password as it requires (the Intel® default password is **admin**).

Appendix

A

Regulatory Compliance

DECLARATION OF CONFORMITY

This equipment has been tested and found to comply with specifications for CE marking. If the user modifies and/or installs other devices in the equipment, the CE conformity declaration may no longer apply.

FCC WARNING

This equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation.

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

Appendix

B

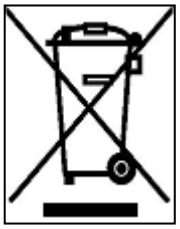
Product Disposal

CAUTION:

Risk of explosion if battery is replaced by an incorrect type. Only certified engineers should replace the on-board battery.

Dispose of used batteries according to instructions and local regulations.

- Outside the European Union–If you wish to dispose of used electrical and electronic products outside the European Union, please contact your local authority so as to comply with the correct disposal method.
- Within the European Union–The device that produces less waste and is easier to recycle is classified as electronic device in terms of the European Directive 2012/19/EU (WEEE), and must not be disposed of as domestic garbage.



EU-wide legislation, as implemented in each Member State, requires that waste electrical and electronic products carrying the mark (left) must be disposed of separately from normal household waste. This includes monitors and electrical accessories, such as signal cables or power cords. When you need to dispose of your device, please follow the guidance of your local authority, or ask the shop where you purchased the product. The mark on electrical and electronic products only applies to the current European Union Member States.

Please follow the national guidelines for electrical and electronic product disposal.

Appendix

C

Error Beep Code

C.1 PEI Beep Codes

Number of Beeps	Description
1	Memory not Installed
1	Memory was installed twice (InstallPeiMemory routine in PEI Core called twice)
2	Recovery started
3	DXEIPL was not found
3	DXE Core Firmware Volume was not found
4	Recovery failed
4	S3 Resume failed
7	Reset PPI is not available

C.2 DXE Beep Codes

Number of Beeps	Description
1	Invalid password
4	Some of the Architectural Protocols are not available
5	No Console Output Devices are found
5	No Console Input Devices are found
6	Flash update is failed
7	Reset protocol is not available
8	Platform PCI resource requirements cannot be met

NOTE:

If you have any question, please contact IEI for further assistance.

Appendix

D

Hazardous Materials Disclosure

D.1 RoHS II Directive (2015/863/EU)

The details provided in this appendix are to ensure that the product is compliant with the RoHS II Directive (2015/863/EU). The table below acknowledges the presences of small quantities of certain substances in the product, and is applicable to RoHS II Directive (2015/863/EU).

Please refer to the following table.

Part Name	Toxic or Hazardous Substances and Elements									
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (CR(VI))	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)	Bis(2-ethylhexyl) phthalate (DEHP)	Butyl benzyl phthalate (BBP)	Dibutyl phthalate (DBP)	Diisobutyl phthalate (DIBP)
Housing	O	O	O	O	O	O	O	O	O	O
Printed Circuit Board	O	O	O	O	O	O	O	O	O	O
Metal Fasteners	O	O	O	O	O	O	O	O	O	O
Cable Assembly	O	O	O	O	O	O	O	O	O	O
Fan Assembly	O	O	O	O	O	O	O	O	O	O
Power Supply Assemblies	O	O	O	O	O	O	O	O	O	O
Battery	O	O	O	O	O	O	O	O	O	O

O: This toxic or hazardous substance is contained in all of the homogeneous materials for the part is below the limit requirement in Directive (EU) 2015/863.

X: This toxic or hazardous substance is contained in at least one of the homogeneous materials for this part is above the limit requirement in Directive (EU) 2015/863.

D.2 China RoHS

此附件旨在确保本产品符合中国 RoHS 标准。以下表格标示此产品中某有毒物质的含量符合中国 RoHS 标准规定的限量要求。

本产品上会附有"环境友好使用期限"的标签，此期限是估算这些物质"不会有泄漏或突变"的年限。本产品可能包含有较短的环境友好使用期限的可替换元件，像是电池或灯管，这些元件将会单独标示出来。

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (CR(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
壳体	O	O	O	O	O	O
印刷电路板	O	O	O	O	O	O
金属螺帽	O	O	O	O	O	O
电缆组装	O	O	O	O	O	O
风扇组装	O	O	O	O	O	O
电力供应组装	O	O	O	O	O	O
电池	O	O	O	O	O	O

O: 表示该有毒有害物质在该部件所有物质材料中的含量均在 SJ/T11364-2014 與 GB/T26572-2011 标准规定的限量要求以下。

X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11364-2014 與 GB/T26572-2011 标准规定的限量要求。