



MODEL:
WAFER-JL-N5105

**3.5" SBC with Intel® 10nm Jasper Lake Celeron®
N5105 Processor with Dual Displays, DDR4, Triple
Intel® 2.5 GbE, USB3.2, M.2, SATA, COM, SoC, RoHS**

User Manual

Revision

Date	Version	Changes
March 25, 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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Chapter

1

Introduction

1.1 Introduction



Figure 1-1: WAFER-JL-N5105

The WAFER-JL-N5105 is a 3.5" industrial motherboard equipped with an Intel® Celeron® N5105 quad-core Jasper Lake processor supporting 4 cores, 4 threads, turbo up-to 2.60 GHz with L3 cache, and supports one 260-pin 2933 MHz dual-channel DDR4 SDRAM SO-DIMM slot with up to 16 GB of memory.

The WAFER-JL-N5105 series includes a HDMI1.4 (up to 4096 x 2160@30Hz) connector and a DP1.4 (up to 4096 x 2160 @60Hz) connector for dual independent display.

Expansion and I/O include one M.2 A-key slot for Wi-Fi or Bluetooth expansions, one M.2 B-key slot with SIM holder for 5G module or NVMe storage expansions. Two USB 3.2 Gen 2 connectors on the rear panel, two USB 2.0 connectors by pin header and one SATA 6Gb/s connector. Serial device connectivity is provided by two internal RS-232 connectors. Three RJ-45 GbE connectors provide the system with smooth connections to an external LAN.

WAFER-JL-N5105 SBC

1.2 Features

Some of the WAFER-JL-N5105 motherboard features are listed below:

- Intel® Celeron® N5105 on-board SoC, 4 cores and 4 threads, 2.00GHz base frequency
- Three Intel® I225V 2.5GbE ports
- Two USB 3.2 Gen 2, two USB 2.0, two RS-232
- M.2 A key and M.2 B key expansions
- Support dual independent display via HDMI and DP

1.3 Connectors

The connectors on the WAFER-JL-N5105 are shown in the figure below.

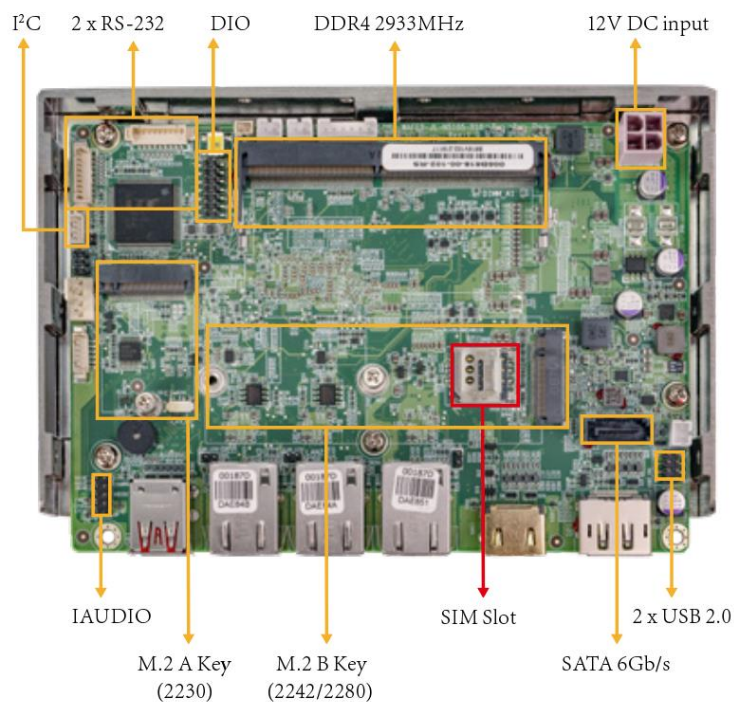


Figure 1-2: Connectors

1.4 Dimensions

The dimensions of the board are listed below:

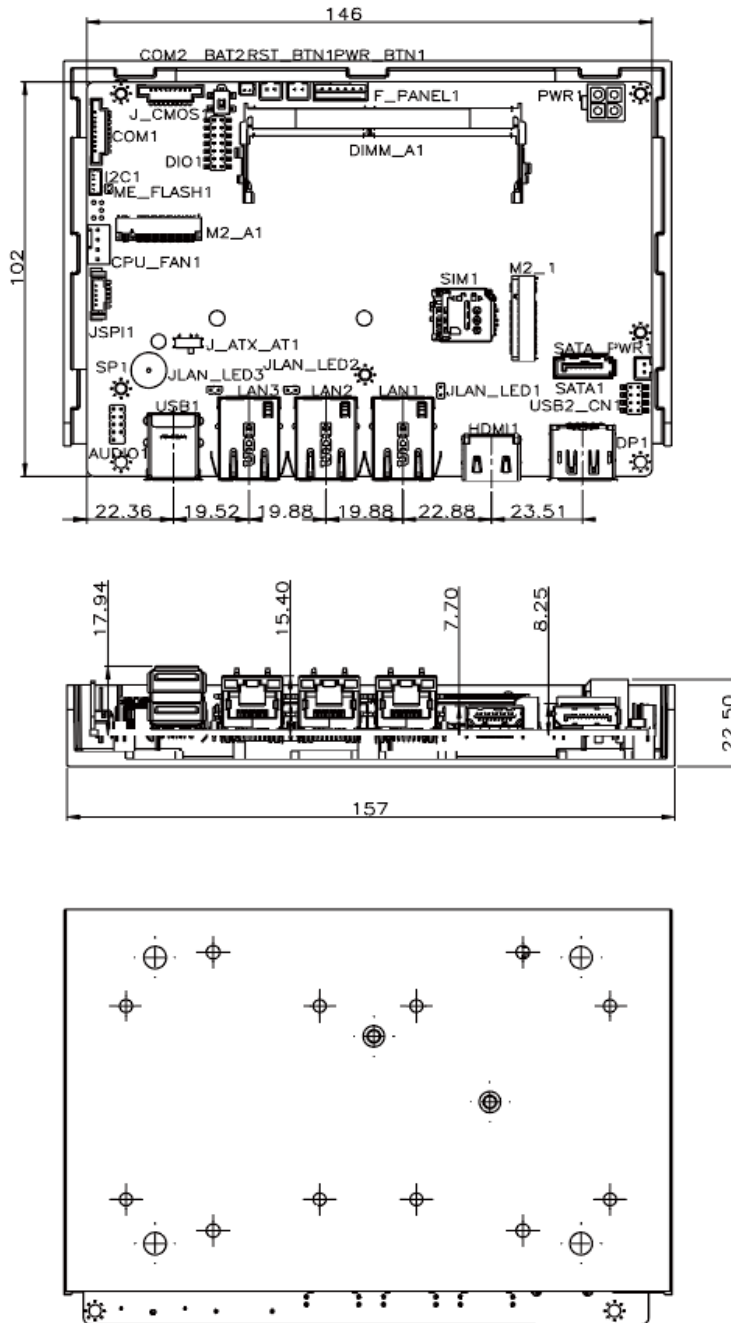


Figure 1-3: Dimensions (mm)

WAFER-JL-N5105 SBC

1.5 Data Flow

Shows the data flow between the system chipset, the CPU and other components installed on the motherboard.

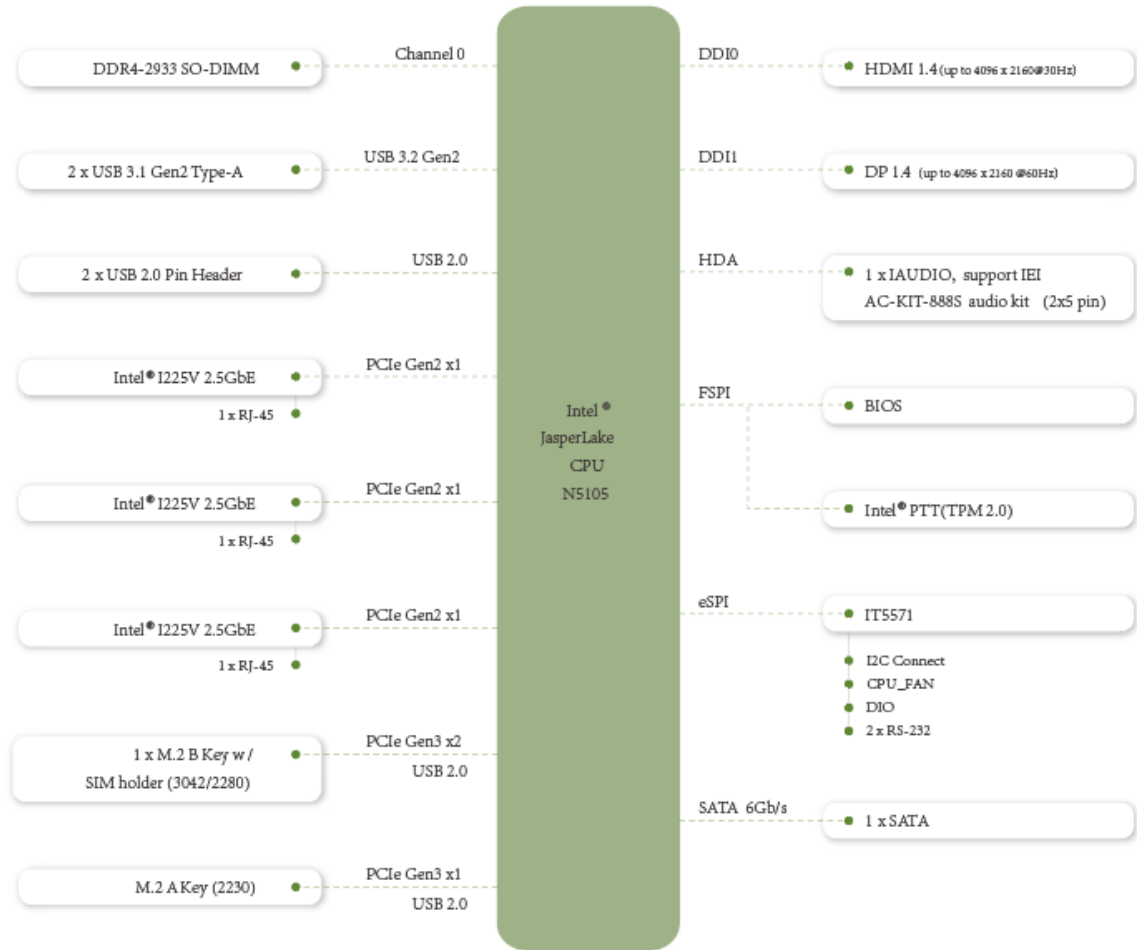


Figure 1-4: Data Flow Diagram

1.6 Technical Specifications

WAFER-JL-N5105 technical specifications are listed below.

Specification	WAFER-JL-N5105
SoC	Intel® Celeron® N5105 on-board SoC (up to 2.90GHz, Quad-core, 4M Cache, TDP=10W)
BIOS	AMI UEFI BIOS
Memory	One 260-pin 2933 MHz dual-channel DDR4 SO-DIMM (system max. 16GB)
Graphics	Intel® Gen 11 UHD Graphics
Display Output	Dual independent display 1 x DP 1.4 (up to 4096 x 2160 @60Hz) 1 x HDMI 1.4 (up to 4096 x 2160@30Hz)
Ethernet	3 x Intel® I225V 2.5GbE controller (Colay with I225-LM)
Digital I/O	12-bit digital I/O by 14-pin (2x7) header
Embedded Controller	ITE IT5571E
Watchdog Timer	Software programmable support 1~255 sec. system reset
I/O Interface	
Audio Connector	1 x IAUDIO supports IEI AC-KIT-888S Audio Kit (2x5 pin)
Ethernet	3 x RJ-45 GbE port
Serial Ports	2 x RS-232 by 9-pin (1x9 pin, P=1.25) wafer
USB Ports	2 x USB 3.2 Gen 2 on rear I/O 2 x USB 2.0 by 8-pin (2x4 pin, P=2.0) header
Front Panel	1 x Power LED and HDD LED connector by 6-pin (1x6) wafer 1 x Power button connector by 2-pin wafer 1 x Reset button connector by 2-pin wafer
LAN LED	3 x LAN link LED connector by 2-pin header
Fan	1 x System Smart fan connector by 4-pin (1x4) wafer
SMBus/I²C	1 x I ² C connector by 4-pin (1x4) wafer
Storage	1 x SATA 6Gb/s with 5 V SATA power connectors

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Specification	WAFER-JL-N5105
Expansions	1 x M.2 2230 A key (PCIe Gen3 x1, USB 2.0) 1 x M.2 3042/2280 B key w/ SIM holder (PCIe Gen3 x2, USB 2.0)
Environmental and Power Specifications	
Power Supply	12 V DC input only (AT/ATX support)
Power Connector	1 x Internal power connector by 4-pin (2x2) connector
Power Consumption	12V@2.45A (Intel® Pentium® Silver N6000 3.30 GHz TDP 6W with one 16GB 2933MHz DDR4 SO-DIMM)
Operating Temperature	0°C ~ 60°C
Storage Temperature	-30°C ~ 70°C
Humidity	5% ~ 95%, non-condensing
Physical Specifications	
Dimensions	115mm x 165 mm
Weight GW/NW	850g / 350g

Table 1-1: Technical Specifications

Chapter

2

Unpacking

WAFER-JL-N5105 SBC

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 WAFER-JL-N5105 is unpacked, please do the following:

- Follow the antistatic 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 WAFER-JL-N5105 was purchased from or contact an IEI sales representative directly by sending an email to sales@ieiworld.com.

The WAFER-JL-N5105 is shipped with the following components:




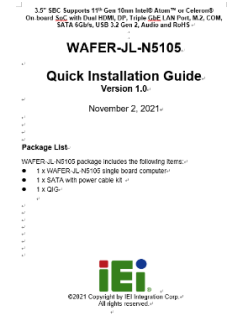
Quantity	Item and Part Number	Image
1	WAFER-JL-N5105 single board computer	
1	Power cable	
1	SATA with power cable kit	
1	Quick Installation Guide	 <p>3.5" SBC Supports 11th Gen Intel® Atom™ or Celeron® On board SBC with Dual HDMI, DP, 1 Gbps GbE LAN Port, M.2, COM, SATA, USB, 2x CAN, 2x Audio and 8x I/O</p> <p>WAFER-JL-N5105</p> <p>Quick Installation Guide Version 1.0 November 2, 2021</p> <p>Package List:</p> <p>WAFER-JL-N5105 package includes the following items:-</p> <ul style="list-style-type: none"> • 1 x WAFER-JL-N5105 single board computer • 1 x SATA with power cable kit • 1 x QIG <p>IEI</p> <p>©2021 Copyright by IEI Integration Corp. All rights reserved.</p>

Table 2-1: Packing List

WAFER-JL-N5105 SBC

2.4 Optional Items

The following are optional components which may be separately purchased:






Item and Part Number	Image
Dual-port USB 2.0 cable, 210mm, P=2.0 (P/N : CB-USB02A-RS)	
RS-232 cable, 250 mm, p=1.25 (P/N : 32005-003500-200-RS)	
Audio kit, 7.1 Channel (P/N: AC-KIT-888S-R10)	
Cooler module, 157 mm x 100 mm x 20 mm, with pad and fan (P/N: 19XM0B619-0002001-000-RS)	
Heatsink module, 157 mm x 100 mm x 20 mm, with pad (P/N: 19XM0B619-0002002-000-RS)	

Table 2-2: Optional Items

Chapter

3

Connectors

WAFER-JL-N5105 SBC

3.1 Peripheral Interface Connectors

This chapter details all the jumpers and connectors.

3.1.1 WAFER-JL-N5105 Layout

The figures below show all the connectors and jumpers.

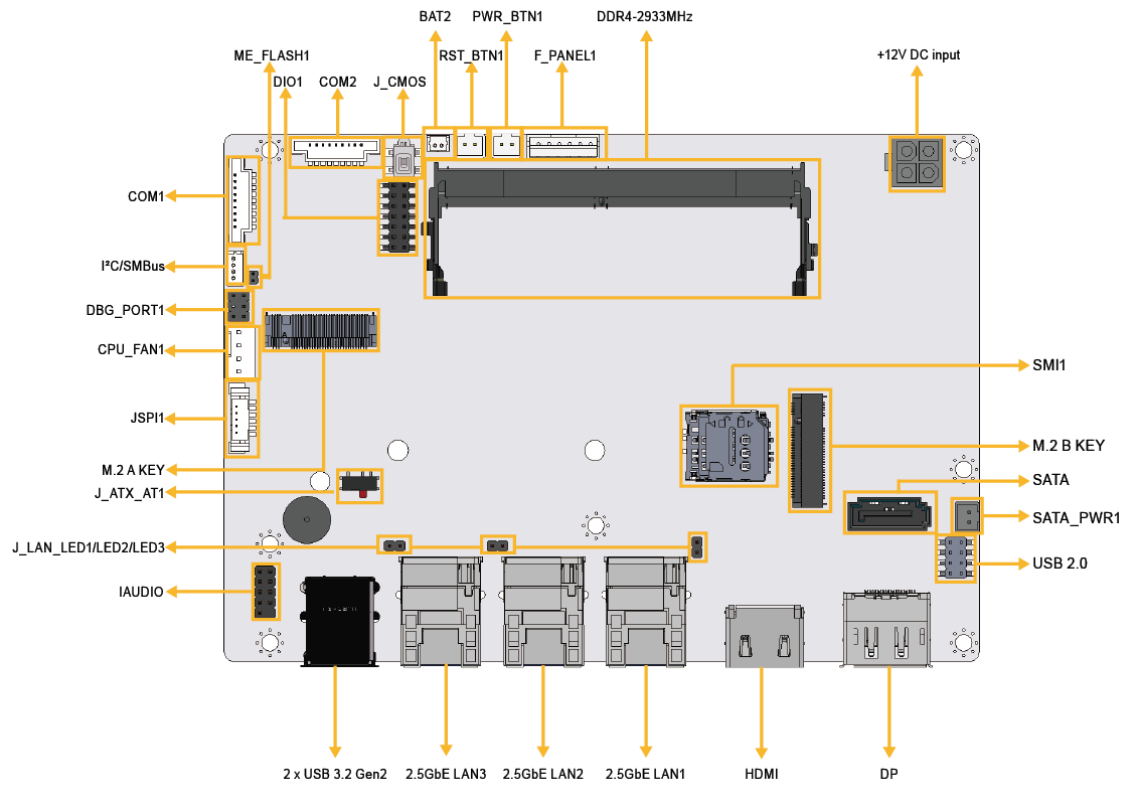


Figure 3-1: Connector And Jumper Locations

3.1.2 Peripheral Interface Connectors

The table below lists all the connectors on the board.

Connector	Type	Label
Clear CMOS button	Button	J_CMOS1
AT/ATX power mode setting	3-pin header	J_ATX_AT1
ME override setting jumper	2-pin header	ME_FLASH1
Internal audio connector	10-pin header	AUDIO1
ATX 12V power connector	4-pin Molex	PWR1
Digital I/O connector	14-pin header	DIO1
Fan connector	4-pin header	CPU_FAN1
Power LED & HDD LED connector	6-pin wafer	F_PANEL1
LAN1 link LED connector	2-pin header	JLAN_LED1
LAN2 link LED connector	2-pin header	JLAN_LED2
LAN3 link LED connector	2-pin header	JLAN_LED3
Battery connector	2-pin wafer	BAT2
Power button connector	2-pin wafer	PWR_BTN1
Reset button connector	2-pin wafer	RST_BTN1
RS-232serial port connectors	9-pin wafer	COM1, COM2
SATA 6Gb/s connectors	7-pin SATA connector	SATA1
SATA power connector	2-pin wafer	SATA_PWR1
I2C connector	4-pin wafer	I2C1
Flash SPI ROM connector	6-pin wafer	JSPI1
Internal USB 2.0 connector	8-pin header	USB2_CN1
M.2 B-key slot	M.2 B-key slot	M2_1
M.2 A-key slot	M.2 A-key slot	M2_A1
SIM slot	7-pin SIM holder	SIM1
DDR4 SO-DIMM Socket	260-pin SO-DIMM	DIMM_A1

Table 3-1: Peripheral Interface Connectors

WAFER-JL-N5105 SBC**3.1.3 External Interface Panel Connectors**

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

Connector	Type	Label
External 2.5GbE RJ-45 connectors	RJ45	LAN1, LAN2, LAN3
External USB 3.2 Gen 2x1 Type-A connector	USB 3.2 Gen 2 Type-A	USB1
External DisplayPort connector	DP	DP1
External HDMI connector	HDMI	HDMI1

Table 3-2: Rear Panel Connectors

3.2 Internal Peripheral Connectors

The section describes all of the connectors on the WAFER-JL-N5105.

3.2.1 Clear CMOS Button

CN Label:	J_CMOS1
CN Type:	Button
CN Location:	See Figure 3-2
CN Pinouts:	See Table 3-3

To clear the CMOS Setup (for example if you have forgotten the password, you should clear the CMOS and then reset the password), you should disconnect the RTC battery and press the button for about 3 seconds. This will set back to normal operation mode.

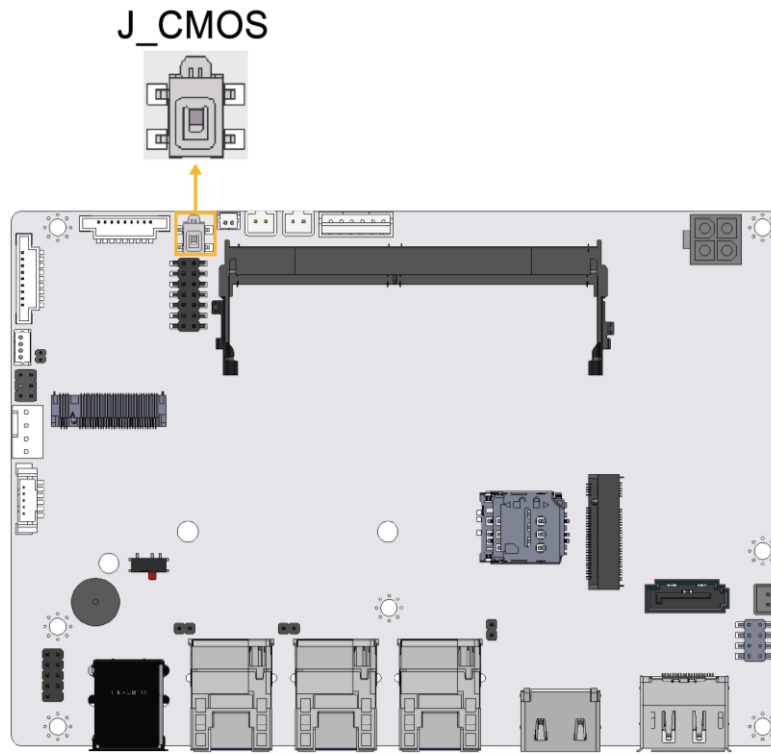


Figure 3-2: Clear CMOS Location

PIN NO.	DESCRIPTION
NC (default)	Keep CMOS Setup (Normal Operation)
Press button	Clear CMOS Setup

Table 3-3: Clear CMOS Pinouts

WAFER-JL-N5105 SBC

3.2.1 AT/ATX Power Mode Setting

- CN Label:** J_ATX_AT1
- CN Type:** 3-pin switch
- CN Location:** See Figure 3-3
- CN Pinouts:** See Table 3-4

The AT/ATX power mode selection is made through the AT/ATX power mode switch which is shown in Figure3-3.

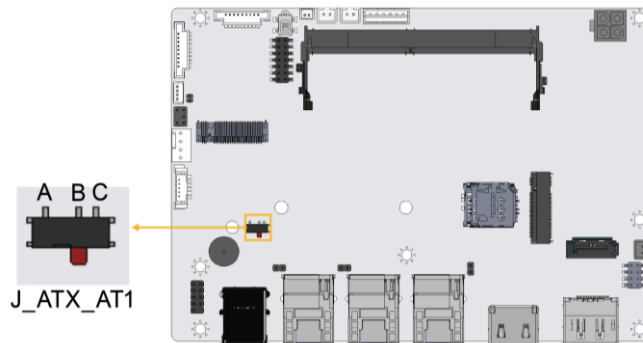


Figure 3-3: AT/ATX Power Mode Switch Locations

PIN NO.	DESCRIPTION
Short A - B	ATX Power Mode (default)
Short B - C	AT Power Mode

Table 3-4: AT/ATX Power Mode Switch Pinouts

3.2.2 ME Override Setting Jumper

- CN Label:** ME_FLASH1
- CN Type:** 2-pin header,P=1.27mm
- CN Location:** See Figure 3-4
- CN Pinouts:** See Table 3-5

The ME_FLASH1 connector is used for Flash Descriptor Security Override or ME Debug Mode.

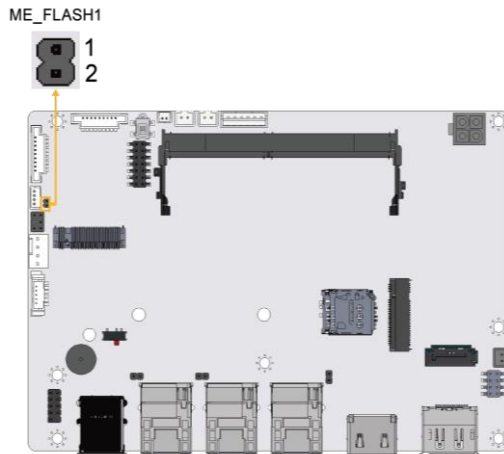


Figure 3-4: ME Override Setting Jumper Locations

PIN NO.	DESCRIPTION
Open	Disable (default)
Short	Enable

Table 3-5: ME Override Setting Jumper Pinouts

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

- Step 1:** Before turning on the system power, short 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 to its default setting.
- Step 4:** Restart the system. The system will reboot 2 ~ 3 times to complete the ME firmware update.

WAFER-JL-N5105 SBC

3.2.3 Audio Connector

- CN Label:** AUDIO1
- CN Type:** 10-pin header, p=2.00 mm
- CN Location:** See **Figure 3-5**
- CN Pinouts:** See **Table 3-6**

The audio connector is connected to external audio devices (AC-KIT-888S-R10) including speakers and microphones for the input and output of audio signals to and from the system.

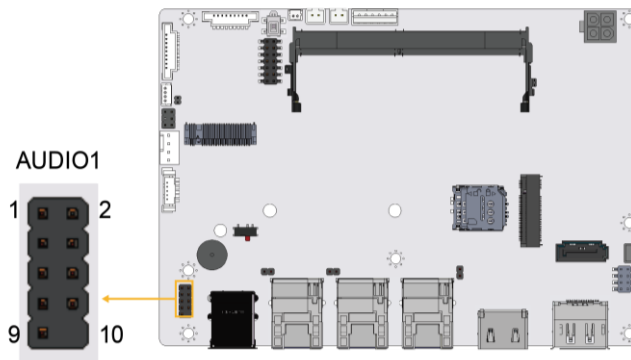


Figure 3-5: Audio Connector Location

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	HDA_SYNC_R	2	HDA_BIT_CLK_R
3	HDA_SDOUT_R	4	HDA_PCBEEP_R
5	HDA_SDIN_R	6	HDA_RST#_R
7	P5V	8	GND
9	P12V	10	GND

Table 3-6: Audio Connector Pinouts

3.2.4 ATX 12V Power Connector

- CN Label:** PWR1
- CN Type:** 4-pin Molex, p=4.2 mm
- CN Location:** See **Figure 3-6**
- CN Pinouts:** See **Table 3-7**

The connector supports the +12V power supply.

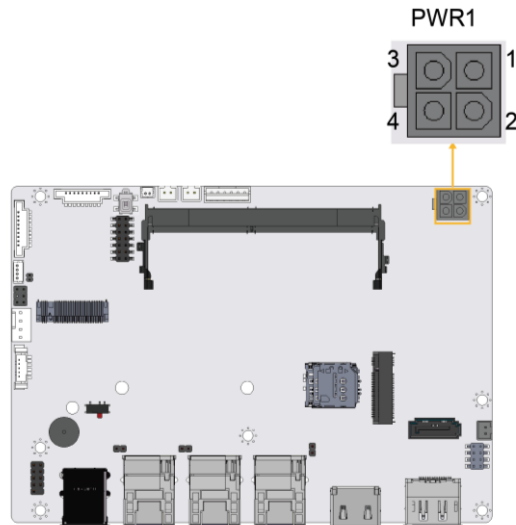


Figure 3-6: ATX 12V Power Connector Location

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GND	2	GND
3	+12V	4	+12V

Table 3-7: ATX 12V Power Connector Pinouts

3.2.5 Digital I/O Connector

- CN Label:** DIO1
- CN Type:** 10-pin wafer, p=2.0 mm
- CN Location:** See **Figure 3-7**
- CN Pinouts:** See **Table 3-8**

WAFER-JL-N5105 SBC

The 12-bit digital I/O connector provides programmable input and output for external devices.

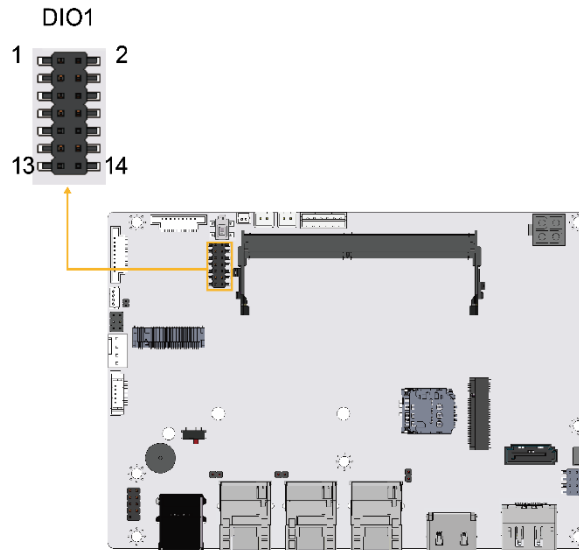


Figure 3-7: Digital I/O Connector Location

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GND	2	VCC
3	DOUT5	4	DOUT4
5	DOUT3	6	DOUT2
7	DOUT1	8	DOUT0
9	DIN5	10	DIN4
11	DIN3	12	DIN2
13	DIN1	14	DIN0

Table 3-8: Digital I/O Connector Pinouts

3.2.6 Fan Connector

- CN Label:** CPU_FAN1
- CN Type:** 4-pin wafer, p=2.54 mm
- CN Location:** See **Figure 3-8**
- CN Pinouts:** See **Table 3-9**

The fan connector attaches to a smart cooling fan.

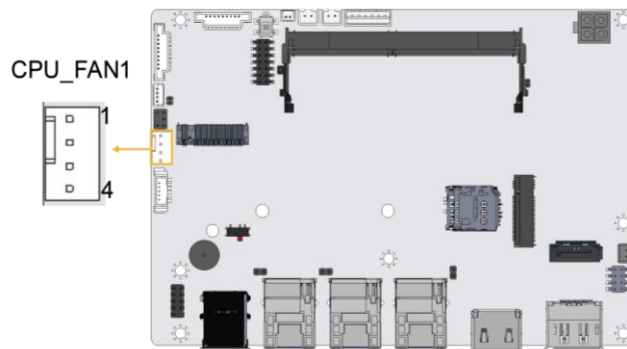


Figure 3-8: Fan Connector Location

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

Table 3-9: Fan Connector Pinouts

WAFER-JL-N5105 SBC

3.2.7 Power LED & HDD LED Connector

- CN Label:** F_PANEL1
- CN Type:** 6-pin wafer, p=2.00 mm
- CN Location:** See Figure 3-9
- CN Pinouts:** See Table 3-10

The front panel connector connects to the power LED indicator and HDD LED indicator on the system front panel.

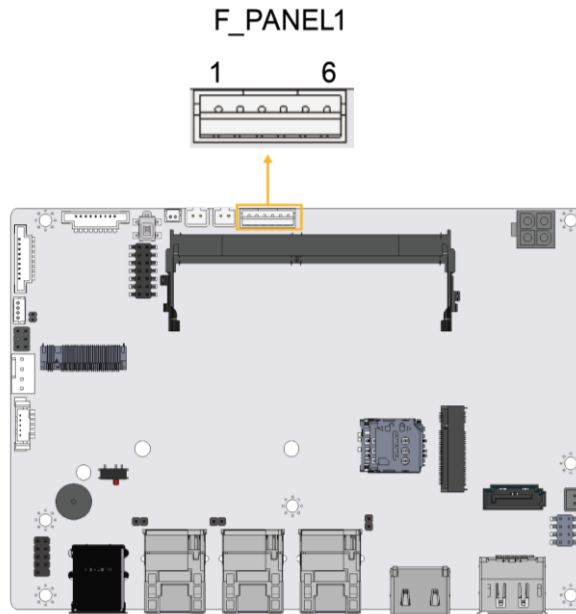


Figure 3-9: Power LED & HDD LED Connector Location

Pin	Description	Pin	Description
1	VCC	2	GND
3	PWR_LED+	4	PWR_LED-
5	HDD_LED+	6	HDD_LED-

Table 3-10: Power LED & HDD LED Connector Pinouts

3.2.8 LAN LED Connectors

- CN Label:** JLAN_LED1, JLAN_LED2, JLAN_LED3
- CN Type:** 2-pin header, p=2.00 mm
- CN Location:** See **Figure 3-10**
- CN Pinouts:** See **Table 3-11**, **Table 3-12** and **Table 3-13**

The LAN LED connectors connect to the LAN link LEDs on the system.

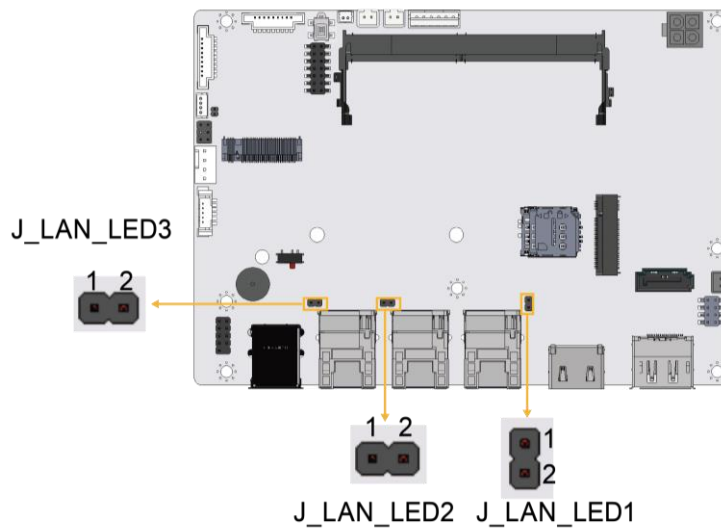


Figure 3-10: LAN LED Connector Locations

Pin	Description
1	+3.3V
2	LAN1_LED_LNK#_ACT

Table 3-11: LAN1 LED Connector Pinouts

Pin	Description
1	+3.3V
2	LAN2_LED_LNK#_ACT

Table 3-12: LAN2 LED Connector Pinouts

WAFER-JL-N5105 SBC

Pin	Description
1	+3.3V
2	LAN3_LED_LNK#_ACT

Table 3-13: LAN3 LED Connector Pinouts

3.2.9 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 WAFER-JL-N5105 is installed.

CN Label:	BAT2
CN Type:	2-pin wafer, p=1.25 mm
CN Location:	See Figure 3-11
CN Pinouts:	See Table 3-14

The battery connector is connected to the system battery. The battery provides power to the system clock to retain the time when power is turned off.

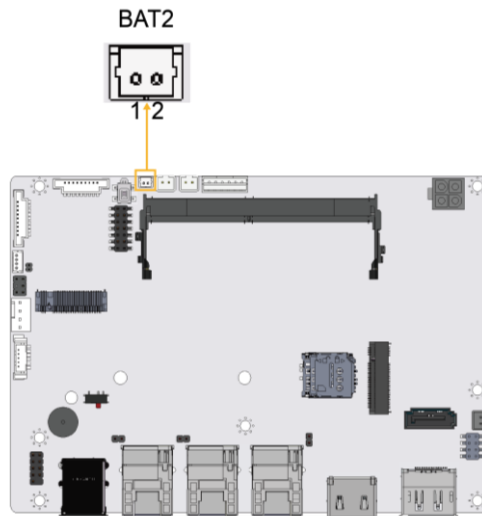


Figure 3-11: Battery Connector Location

Pin	Description
1	VBAT+
2	GND

Table 3-14: Battery Connector Pinouts

WAFER-JL-N5105 SBC

3.2.10 Power Button Connector

- CN Label:** PWR_BTN1
- CN Type:** 2-pin wafer, p=2.00 mm
- CN Location:** See **Figure 3-12**
- CN Pinouts:** See **Table 3-15**

The power button connector is connected to a power switch on the system chassis to enable users to turn the system on and off.

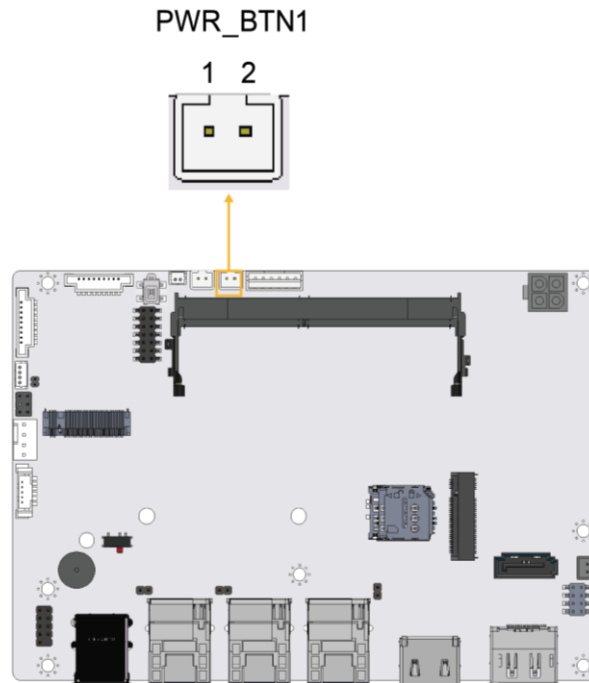


Figure 3-12: Power Button Connector Location

Pin	Description
1	PWR_BTN+
2	PWR_BTN-

Table 3-15: Power Button Connector Pinouts

3.2.11 Reset Button Connector

- CN Label:** RST_BTN1
- CN Type:** 2-pin wafer, p=2.00 mm
- CN Location:** See **Figure 3-13**
- CN Pinouts:** See **Table 3-16**

The reset button connector is connected to a reset switch on the system chassis to enable users to reboot the system when the system is turned on.

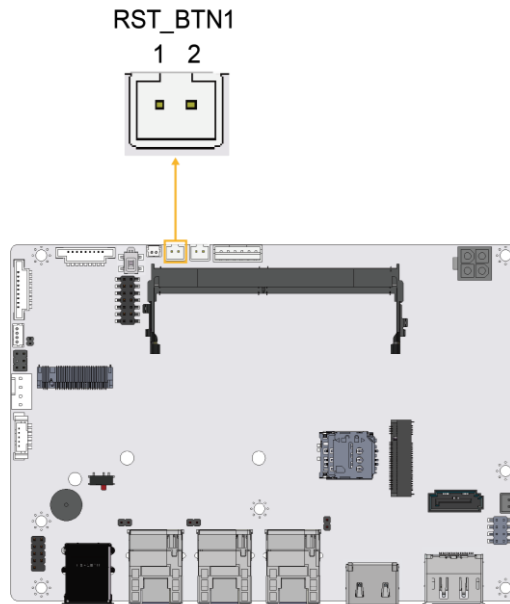


Figure 3-13: Reset Button Connector Location

Pin	Description
1	RESET+
2	RESET-

Table 3-16: Reset Button Connector Pinouts

WAFER-JL-N5105 SBC

3.2.12 RS-232 Serial Port Connector

- CN Label:** COM1,COM2
- CN Type:** 9-pin wafer, p=1.25 mm
- CN Location:** See **Figure 3-14**
- CN Pinouts:** See **Table 3-17**

The serial connector provides RS-232 connection.

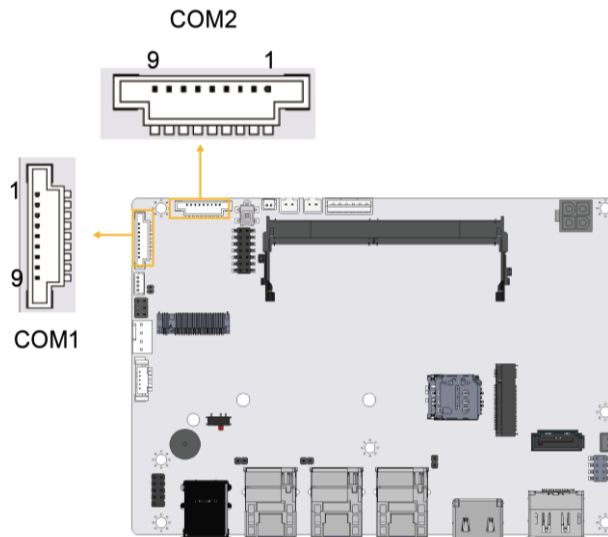


Figure 3-14: RS-232 Serial Port Connector Location

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	DCD	2	DSR
3	RXD	4	RTS
5	TXD	6	CTS
7	DTR	8	RI
9	GND		

Table 3-17: RS-232 Serial Port Connector Pinouts

3.2.13 SATA 6Gb/s Drive Connector

- CN Label:** SATA1
- CN Type:** 7-pin SATA connector
- CN Location:** See **Figure 3-15**
- CN Pinouts:** See **Table 3-18**

The SATA 6Gb/s drive connector is connected to a SATA 6Gb/s drive. The SATA 6Gb/s drive transfers data at speeds as high as 6Gb/s.

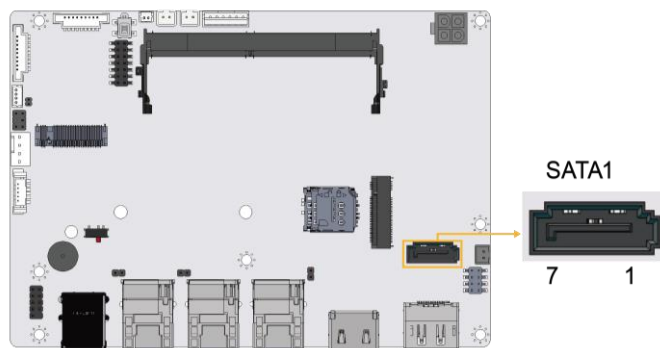


Figure 3-15: SATA 6Gb/s Drive Connectors Location

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GND	5	SATA_RX-
2	SATA_TX+	6	SATA RX+
3	SATA_TX-	7	GND
4	GND	8	N/C

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

WAFER-JL-N5105 SBC

3.2.14 SATA Power Connector

- CN Label:** SATA_PWR1
- CN Type:** 2-pin wafer, p=2.00 mm
- CN Location:** See **Figure 3-16**
- CN Pinouts:** See **Table 3-19**

The SATA power connector provides +5 V power output to the SATA connector.

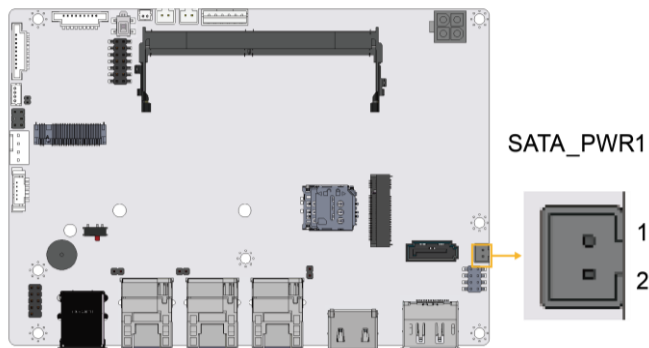


Figure 3-16: SATA Power Connector Location

Pin	Description
1	+5V
2	GND

Table 3-19: SATA Power Connector Pinouts

3.2.15 SMBus/I²C Connector

- CN Label:** I2C1
- CN Type:** 4-pin wafer, p=1.25 mm
- CN Location:** See **Figure 3-17**
- CN Pinouts:** See **Table 3-20**

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

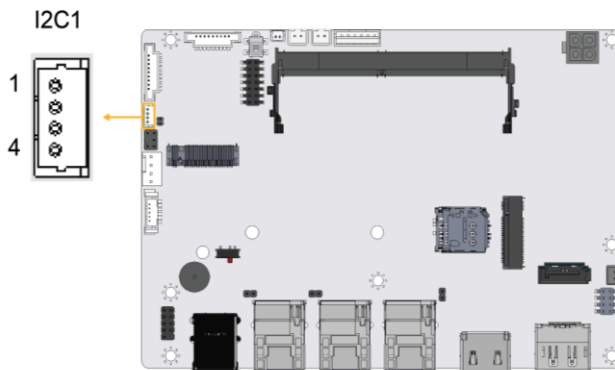


Figure 3-17: SMBus Connector Location

Pin	Description
1	GND
2	SMB DATA
3	SMB CLK
4	+5V

Table 3-20: SMBus Connector Pinouts

WAFER-JL-N5105 SBC

3.2.16 SPI Flash Connector

- CN Label:** JSPI1
- CN Type:** 6-pin wafer, p=1.25 mm
- CN Location:** See **Figure 3-18**
- CN Pinouts:** See **Table 3-21**

The 6-pin SPI Flash connector is used to flash the BIOS.

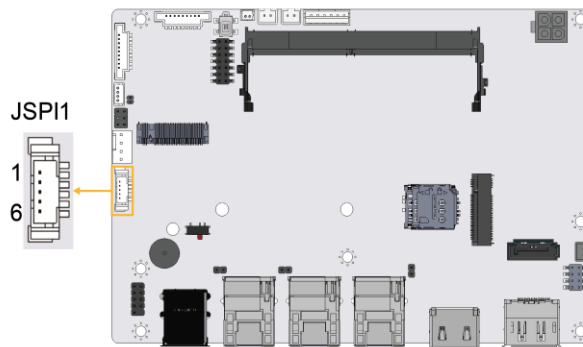


Figure 3-18: SPI Flash Connector Location

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

Table 3-21: SPI Flash Connector Pinouts

3.2.17 USB 2.0 Connector

- CN Label:** USB3
- CN Type:** 8-pin header, p=2.00 mm
- CN Location:** See **Figure 3-19**
- CN Pinouts:** See **Table 3-22**

The USB connector provides two USB 2.0 ports by dual-port USB cable.

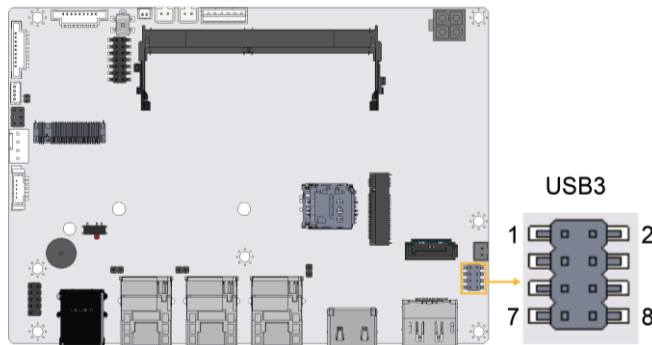


Figure 3-19: USB Connector Location

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	VCC	2	GND
3	USB DATA-	4	USB DATA+
5	USB DATA+	6	USB DATA-
7	GND	8	VCC

Table 3-22: USB Connector Pinouts

WAFER-JL-N5105 SBC

3.2.18 M.2 Slot, B-key

- CN Label:** M2_1
- CN Type:** M.2 B-key slot
- CN Location:** See Figure 3-20
- CN Pinouts:** See Table 3-23

The M.2 B key (3042/2280) slot with PCIe Gen3 x2 and USB 2.0 signal supports NVMe storage or 5G module with SIM holder

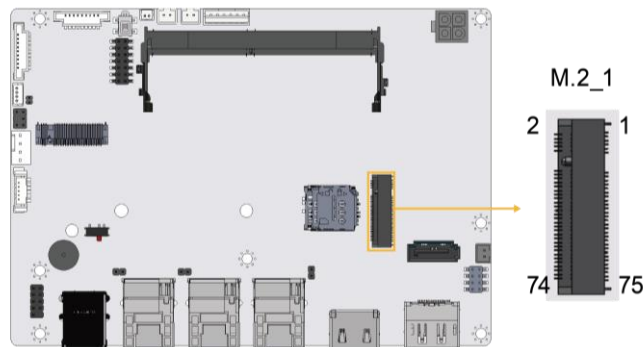


Figure 3-20: M.2 B key Slot Location

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	CONFIG_3	2	+3.3V
3	GND	4	+3.3V
5	GND	6	POWER_OFF
7	USB_D+	8	W_DISABLE
9	USB_D-	10	DAS/DSS#
11	GND	12	Module Key
13	Module Key	14	Module Key
15	Module Key	16	Module Key
17	Module Key	18	Module Key
19	Module Key	20	N/C
21	CONFIG_0	22	N/C
23	N/C	24	N/C

25	N/C	26	GNSS_DISABLE
27	GND	28	N/C
29	PCIE_RXN1	30	UIM_RST
31	PCIE_RXP1	32	UIM_CLK
33	GND	34	UIM_DATA
35	PCIE_TXN1	36	UIM_VCC
37	PCIE_TXP1	38	DEVSLP
39	GND	40	N/C
41	PCIE_RXN0	42	N/C
43	PCIE_RXP0	44	N/C
45	GND	46	N/C
47	PCIE_TXN0	48	N/C
49	PCIE_TXP0	50	PERST#
51	GND	52	CLKREQ#
53	REFCLKN	54	PEWAKE
55	REFCLKP	56	N/C
57	GND	58	N/C
59	N/C	60	N/C
61	N/C	62	N/C
63	N/C	64	N/C
65	N/C	66	N/C
67	WWAN_RST	68	N/C
69	PEDET	70	+3.3V
71	GND	72	+3.3V
73	GND	74	+3.3V
75	CONFIG_2		

Table 3-23: M. 2 B key Slot Pinouts

WAFER-JL-N5105 SBC

3.2.19 M.2 Slot, A-key

- CN Label:** M2_A1
- CN Type:** M.2 A-key slot
- CN Location:** See **Figure 3-21**
- CN Pinouts:** See **Table 3-24**

The M.2 slot is keyed in the A position and accepts 2230 size of M.2 modules. The M.2 slot supports PCIe x2 and USB 2.0 signals.

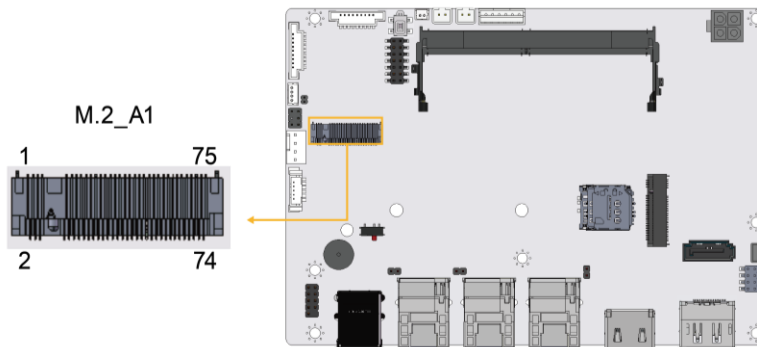


Figure 3-21: M.2 A-key Slot Location

Pin	Description	Pin	Description
1	GND	2	+V3.3A
3	USB+	4	+V3.3A
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
17	NC	18	GND
19	NC	20	NC
21	NC	22	NC

Pin	Description	Pin	Description
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_TX0+	36	GND
37	PCIE_TX0-	38	NC
39	GND	40	NC
41	PCIE_RX0+	42	NC
43	PCIE_RX0-	44	NC
45	GND	46	NC
47	CLK_PCIE0+	48	NC
49	CLK_PCIE0-	50	NC
51	GND	52	BUF_PLT_RST#
53	PCIE_CLKREQ#	54	Pull Up +V3.3A
55	PCIE_WAKE#	56	Pull Up +V3.3A
57	GND	58	NC
59	PCIE_TX1+	60	NC
61	PCIE_TX1-	62	NC
63	GND	64	NC
65	PCIE_RX1+	66	NC
67	PCIE_RX1-	68	NC
69	GND	70	NC
71	CLK_PCIE1+	72	+V3.3A
73	CLK_PCIE1-	74	+V3.3A
75	GND		

Table 3-24: M.2 A-Key Slot Pinouts

WAFER-JL-N5105 SBC

3.2.20 SIM Slot

- CN Label:** SIM1
- CN Type:** 7-PIN SIM holder
- CN Location:** See **Figure 3-22**
- CN Pinouts:** See **Table 3-25**

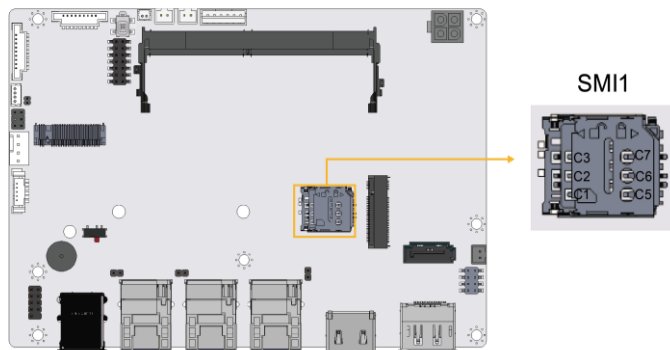


Figure 3-22: SIM Slot Location

PIN NO.	DESCRIPTION
C1	SIM_VCC
C2	SIM_RST
C3	SIM_Clock
C5	GND
C6	SIM_VPP
C7	SIM_DATA

Table 3-25: SIM Slot Pinouts

3.2.21 DDR4 SO-DIMM Socket

- CN Label:** DIMM_A1
- CN Type:** 260-pin DDR4 SO-DIMM socket
- CN Location:** See **Figure 3-23**

The SO-DIMM slot is for installing the DDR4 SO-DIMM.

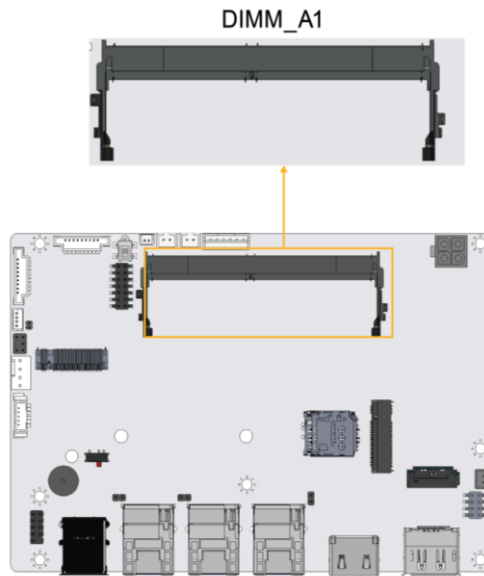


Figure 3-23: DDR4 SO-DIMM Socket Location

WAFER-JL-N5105 SBC

3.3 External Peripheral Interface Connector Panel

Figure 3-24 shows the WAFER-JL-N5105 external peripheral interface connector (EPIC) panel. The EPIC panel consists of the following:

- 1x HDMI & 1 x DP connector
- 3 x GbE RJ-45 connector
- 2x USB 3.2 Gen 2 connector

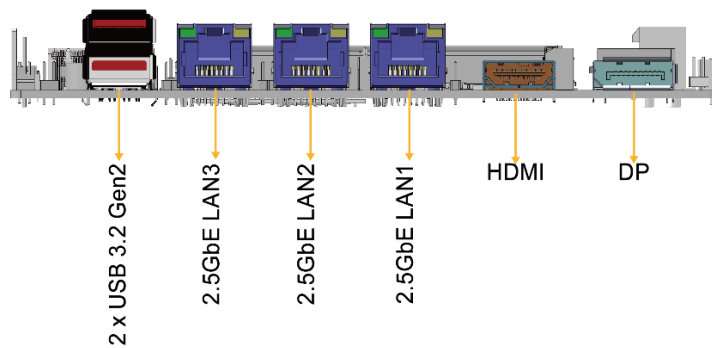


Figure 3-24: External Peripheral Interface Connector

3.3.1 External 2.5GbE RJ-45 Connectors

- CN Label:** LAN1, LAN2, LAN3
- CN Type:** RJ-45
- CN Location:** See [Figure 3-25](#)
- CN Pinouts:** See [Table 3-26](#)

The LAN connector connects to a local network. LAN LED location and pinouts see [Figure 3-26](#) and [Table 3-27](#).

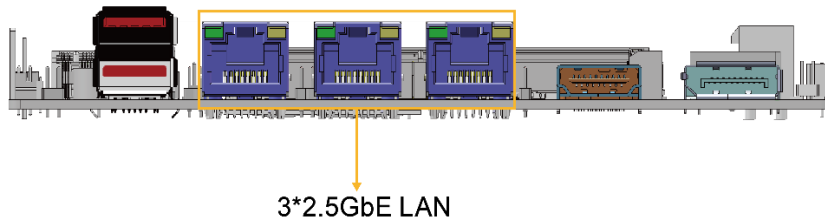


Figure 3-25: LAN Location

Pin	Description	Pin	Description
1	MDI0P	5	MDI2P
2	MDI0N	6	MDI2N
3	MDI1P	7	MDI3P
4	MDI1N	8	MDI3N

Table 3-26: LAN Pinouts

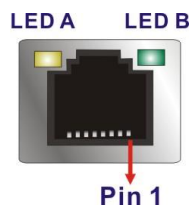


Figure 3-26: LAN LED Location

WAFER-JL-N5105 SBC

LED	Description	LED	Description
A	on: linked blinking: data is being sent/received	B	off: 100 Mb/s orange: 1000 Mb/s green: 2500 Mb/s

Table 3-27: LAN LED Pinouts

3.3.1 External USB 3.2 Gen 2x1 Type-A

- CN Label:** USB1, USB2
- CN Type:** USB 3.2 Gen 2 port Type-A
- CN Location:** See **Figure 3-27**
- CN Pinouts:** See **Table 3-28**

The WAFER-JL-N5105 has four external USB 3.2 Gen 2 ports. The USB connector can be connected to a USB 2.0 or USB 3.2 device. The pinouts of USB 3.2 Gen 2 connectors are shown below.

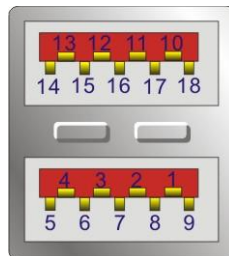


Figure 3-27: USB 3.2 Gen 2 Port Location

Pin	Description	Pin	Description
1	VCC	10	VCC
2	USB_DATA0-	11	USB_DATA1-
3	USB_DATA0+	12	USB_DATA1+
4	GND	13	GND
5	USB3_RX0-	14	USB3_RX1-
6	USB3_RX0+	15	USB3_RX1+
7	GND	16	GND
8	USB3_TX0-	17	USB3_TX1-
9	USB3_TX0+	18	USB3_TX1+

Table 3-28: USB 3.2 Gen 2 Port Pinouts

3.3.1 External DisplayPort Connector

- CN Label:** DP1
- CN Type:** External DP connector
- CN Location:** See Figure 3-28
- CN Pinouts:** See Table 3-29

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	DATA_0P	11	GND
2	GND	12	DATA_3N
3	DATA_0N	13	CONFIG1
4	DATA_1P	14	CONFIG2
5	GND	15	AUX_P
6	DATA_1N	16	GND
7	DATA_2P	17	AUX_N
8	GND	18	DP HPD
9	DATA_2N	19	GND
10	DATA_3P	20	DP PWR

Table 3-29: External Display Port Connector Pinouts

WAFER-JL-N5105 SBC

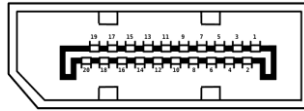


Figure 3-28: External DisplayPort Connector Location

3.3.2 External Interface Panel Connectors

- CN Label:** HDMI1
- CN Type:** HDMI connector
- CN Location:** See **Figure 3-29**
- CN Pinouts:** See Table 3-30

The HDMI connectors can connect to HDMI devices.

Pin	Description	Pin	Description
1	HDMI2_DATA2	2	GND
3	HDMI2_DATA2#	4	HDMI2_DATA1
5	GND	6	HDMI2_DATA1#
7	HDMI2_DATA0	8	GND
9	HDMI2_DATA0#	10	HDMI2_CLK
11	GND	12	HDMI2_CLK#
13	N/C	14	N/C
15	HDMI2_SCL	16	HDM2I_SDA
17	GND	18	+5V
19	HDMI2_HPD		

Table 3-30: HDMI Connector Pinouts

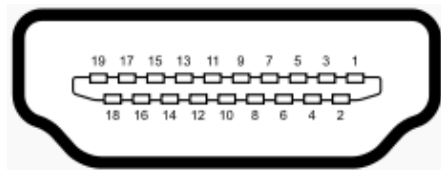


Figure 3-29: HDMI Connector Pinout Locations

Chapter

4

Installation

WAFER-JL-N5105 SBC

4.1 Anti-static Precautions



WARNING:

Failure to take ESD precautions during the installation of the WAFER-JL-N5105 may result in permanent damage to the WAFER-JL-N5105 and severe injury to the user.

Electrostatic discharge (ESD) can cause serious damage to electronic components, including the WAFER-JL-N5105. Dry climates are especially susceptible to ESD. It is therefore critical that whenever the WAFER-JL-N5105 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 WAFER-JL-N5105, place it on an anti-static pad. This reduces the possibility of ESD damaging the WAFER-JL-N5105.
- **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 WAFER-JL-N5105, WAFER-JL-N5105 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 WAFER-JL-N5105 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 WAFER-JL-N5105 on an antistatic pad:
 - When installing or configuring the motherboard, place it on an antistatic pad. This helps to prevent potential ESD damage.
- Turn all power to the WAFER-JL-N5105 off:
 - When working with the WAFER-JL-N5105, 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 WAFER-JL-N5105 **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.

WAFER-JL-N5105 SBC

4.3 SO-DIMM Installation

To install an SO-DIMM, please follow the steps below and refer to **Figure 4-1**.

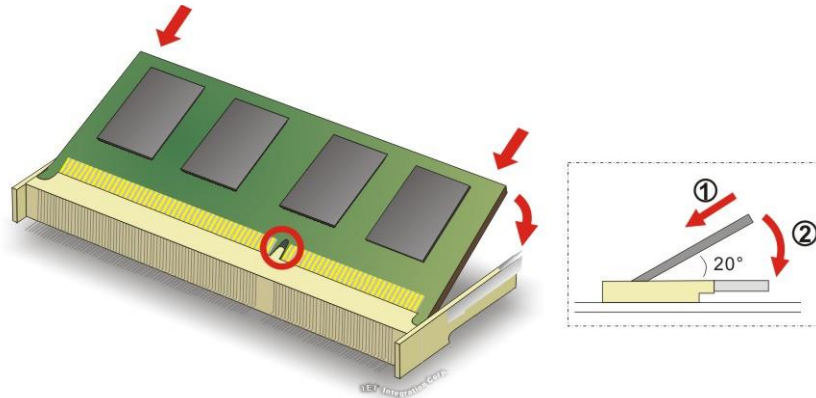


Figure 4-1: SO-DIMM Installation

- Step 1:** Locate the SO-DIMM socket. Place the board on an anti-static mat.
- Step 2:** Align the SO-DIMM with the socket. Align the notch on the memory with the notch on the memory socket.
- Step 3:** Insert the SO-DIMM. Push the memory in at a 20° angle. (See **Figure 4-1**)
- Step 4:** Seat the SO-DIMM. Gently push downwards and the arms clip into place. (See **Figure 4-1**)



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.

4.4 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**.
- Step 2:** Remove the retention screw secured on the motherboard.
- Step 3:** 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 20° (**Figure 4-2**).

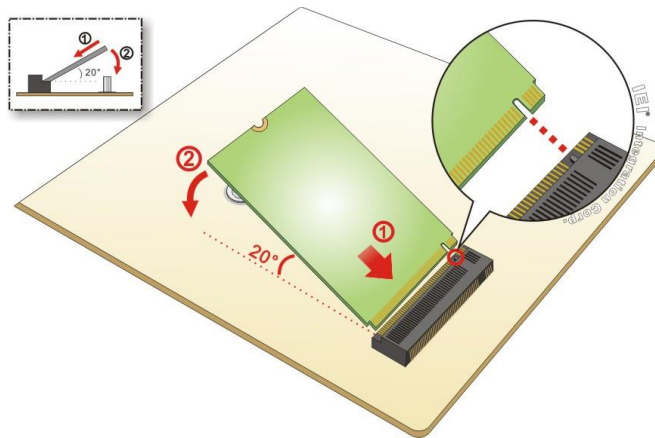


Figure 4-2: Inserting The M.2 Module Into The Slot At An Angle

- Step 4:** Secure the M.2 module with the previously removed retention screw (**Figure 4-3**).

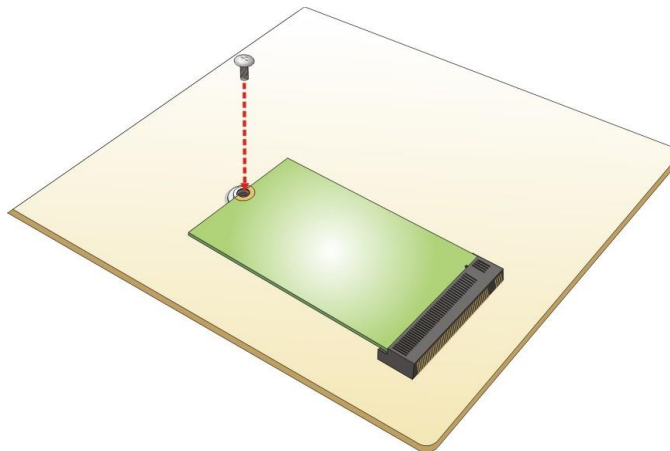


Figure 4-3: Securing The M.2 Module

WAFER-JL-N5105 SBC

4.5 Chassis Installation

4.5.1 Heat Spreader



WARNING:

The heat spreader installed on the WAFER-JL-N5105 can only serve as a heat conductor, which needs additional heat dissipation mechanism to achieve suitable thermal condition. DO NOT put the WAFER-JL-N5105 with the heat spreader directly on a surface that cannot dissipate system heat, and never run the WAFER-JL-N5105 without the heat spreader secured to the board.

When the WAFER-JL-N5105 is shipped, it is secured to a heat spreader with five retention screws. The heat spreader must have a direct contact with a heat dissipation surface to ensure stable operation. In addition, a thin layer of thermal paste has to be applied onto the heat dissipation surface where it contacts the heat spreader.

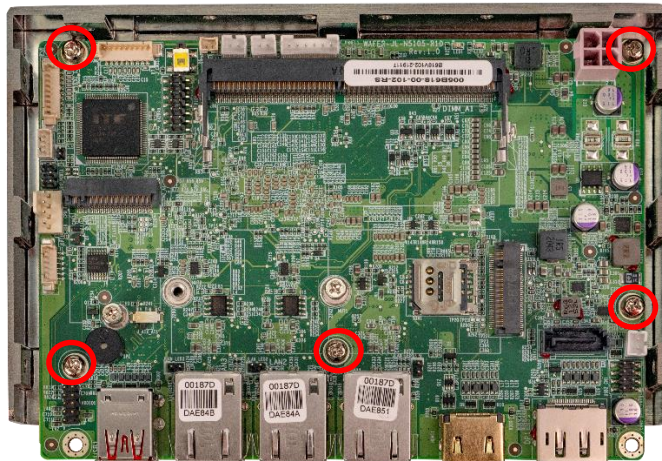


Figure 4-4: Heat Sink Retention Screws

IEI also provides two thermal solutions for customers to choose.

IEI has developed a highly efficient thermal solution for the 3.5" motherboard - IEI Heat Conduction Casing (IHCC). With its well-design structure, the IHCC can effectively improve heat transfer performance and cut time-to-market. It completely joints with the heat spreader for better CPU heat transfer in 0°C–60°C operating temperature using active cooling (P/N: 19XM0B619-0002001-000-RS, see **Figure 4-5**), and in 0°C–45°C operating temperature using passive cooling (P/N:19XM0B619-0002002-000-RS, see **Figure 4-6**).



Figure 4-5: Active Cooling



Figure 4-6: Passive Cooling

4.5.1 Motherboard Installation

IEI recommend you to choose the DRPC-W-JL for the WAFER-JL-N5105 installation. The DRPC-W-JL is a compact embedded chassis designed for 3.5" single board computers. With its two-dimensional heat conduction and low wind resistance design on the surfaced, no extra thermal solution is needed to form the heat dissipation part. Users can get higher hardness, and benefit from the reduced production cost resulting from shortening manufacturing time. Furthermore, the height of aluminum extrusion can therefore be downsized to make the product light weight.



Figure 4-7: DRPC-W-JL-R10



Figure 4-8: DRPC-W-JL-R10 with Extra Fan Cooling

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The WAFER-JL-N5105 is also well designed to fit into other chassis in the market. Each side of the heat spreader has several screw holes allowing the WAFER-JL-N5105 to be mounted into a chassis or a heat sink enclosure (please refer to Figure 1-3 for the detailed dimensions). The user has to design or select a chassis or a heat sink enclosure that has screw holes matching up with the holes on the heat spreader for installing the WAFER-JL-N5105. The following diagram shows an example of motherboard installation.



Figure 4-9: Motherboard Installation Example

4.6 Internal Peripheral Device Connections

This section outlines the installation of peripheral devices to the on-board connectors

4.6.1 AT Power Connection

Follow the instructions below to connect the WAFER-JL-N5105 to an AT power supply.



WARNING:

Disconnect the power supply power cord from its AC power source to prevent a sudden power surge to the WAFER-JL-N5105.

Step 1: **Locate the power cable.** The power cable is shown in the packing list in Chapter 2.

Step 2: Connect the power cable to the motherboard. Connect the 4-pin (2x2) Molex type power cable connector to the power connector on the motherboard. See

Figure 4-10

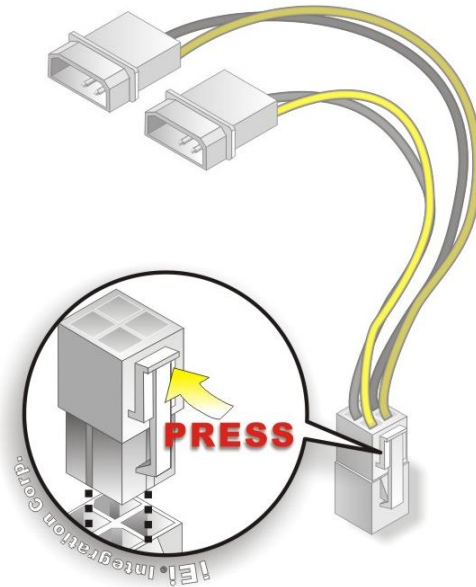


Figure 4-10: Power Cable to Motherboard Connection

Step 3: Connect power cable to power supply. Connect one of the 4-pin (1x4) Molex type power cable connectors to an AT power supply. See **Figure 4-11**

WAFER-JL-N5105 SBC

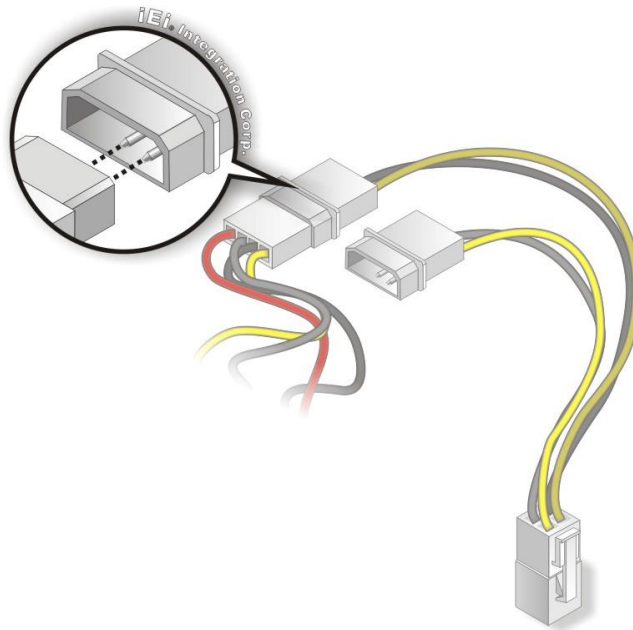


Figure 4-11: Connect Power Cable to Power Supply

4.6.2 7.1 Channel Audio Kit Installation

**NOTE:**

This item must be ordered separately, and connects to the audio connector. For further information please contact the nearest distributor, reseller or vendor or contact an IEI sales representative directly.

The audio kit attaches to the audio connector. The audio kit provides 7.1 channel audio. To install the audio kit, please refer to the steps below:

- Step 1: Connect the cable to the audio kit.** Connect the included cable to the audio kit. Make sure pin 1 aligns with the marked pin.
- Step 2: Connect the cable to the board.** Connect the other end of the cable to the board. Make sure to line up the marked pin 1.

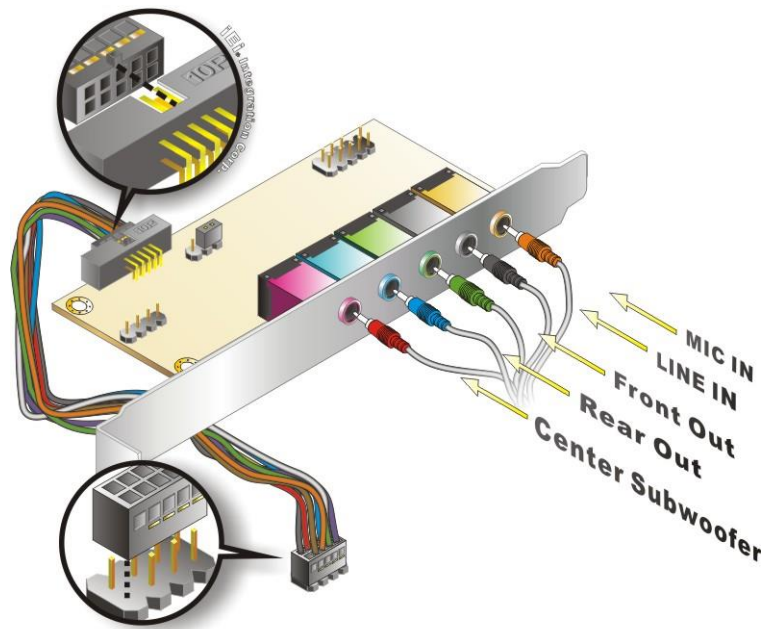


Figure 4-12: 7.1 Channel Audio Kit

- Step 3:** **Mount the audio kit onto the chassis.** Once the audio kit is connected to the board, secure the audio kit bracket to the system chassis.
- Step 4:** **Connect the audio devices.** Connect speakers and external audio sources to the audio jacks on the audio kit.
- Step 5:** **Install the driver.** Install the 7.1 channel audio driver included with the board.

4.6.3 RS-232 Cable Connection

The single RS-232 cable consists of one serial port connector attached to a serial communications cable that is then attached to a D-sub 9 male connector. To install the single RS-232 cable, please follow the steps below.

- Step 1:** **Locate the connector.** The location of the RS-232 connector is shown in Chapter 3.

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- Step 2: Insert the cable connector.** Align the cable connector with the onboard connector. Make sure pin 1 on the board and connector line up. Pin 1 on the cable connector is indicated with a white dot. See **Figure 4-13**.

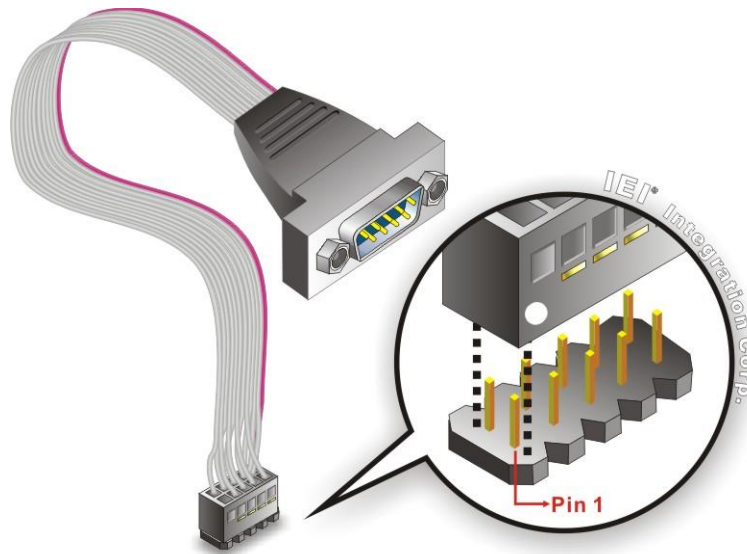


Figure 4-13: Single RS-232 Cable Installation

- Step 3: Secure the bracket.** The single RS-232 connector has two retention screws that must be secured to a chassis or bracket.
- Step 4: Connect the serial device.** Once the single RS-232 connector is connected to a chassis or bracket, a serial communications device can be connected to the system.

4.6.4 SATA Drive Connection

The WAFER-JL-N5105 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 4-14**.

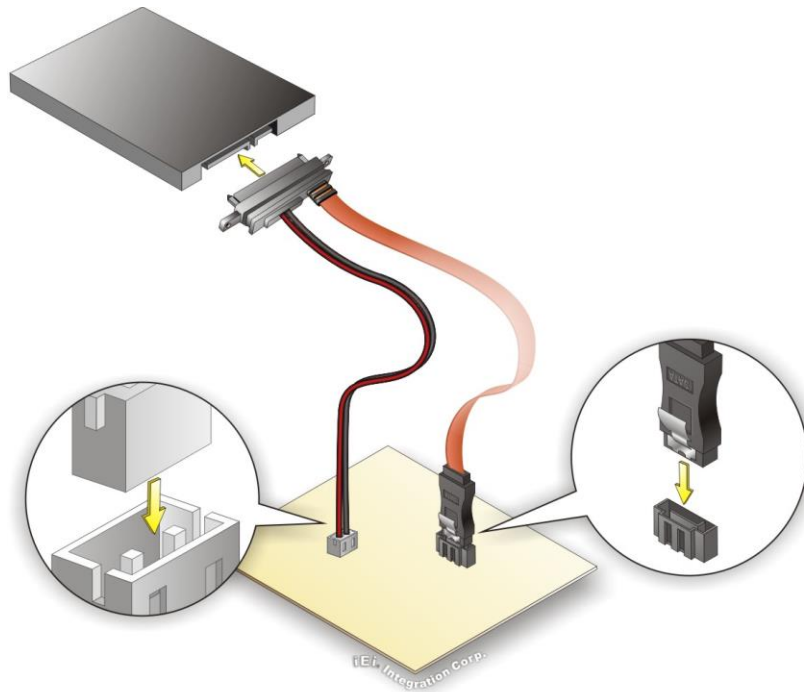


Figure 4-14: SATA Drive Cable Connection

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

Chapter

5

Software Drivers

5.1 Available Drivers

All the drivers for the WAFER-JL-N5105 are available on IEI Resource Download Center (<https://download.ieiworld.com>). Type WAFER-JL-N5105 and press Enter to find all the relevant software, utilities, and documentation.

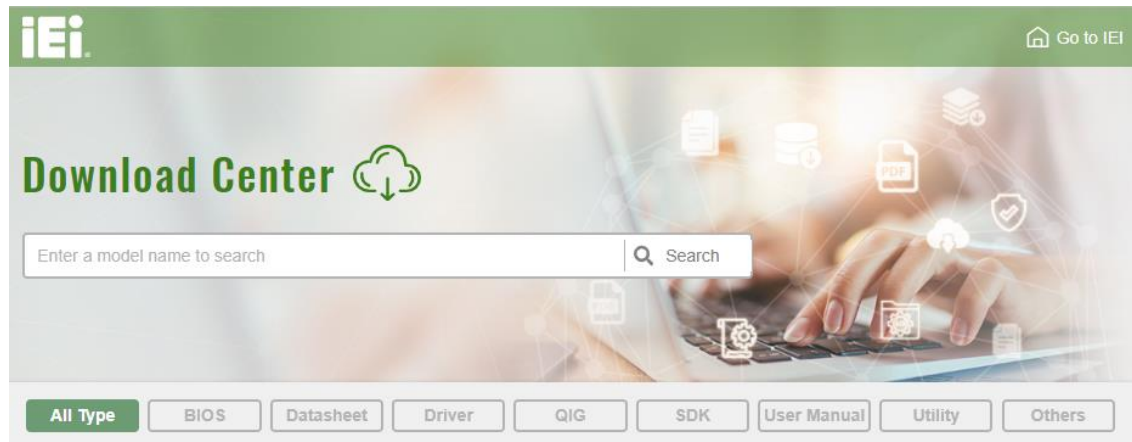
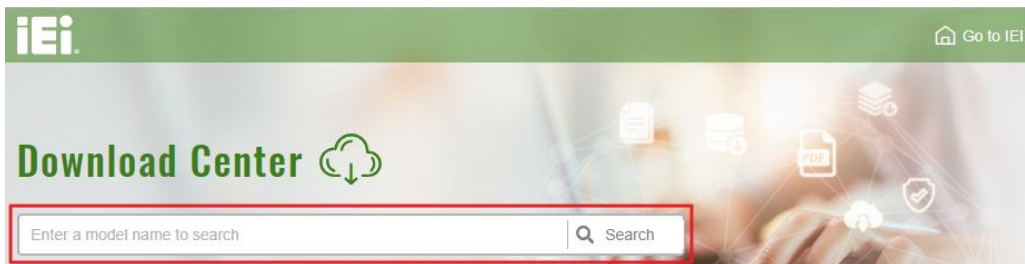


Figure 5-1: IEI Resource Download Center

5.2 Driver Download

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

Step 1: Go to <https://download.ieiworld.com>. Type WAFER-JL-N5105 and press Enter.



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

WAFER-JL-N5105 SBC

All Type BIOS Datasheet **Driver** QIG SDK User Manual Utility Others

i Keyword: "WAFER-ULT5", Searching Result : 6 Records.

WAFER-ULT5 Product Info ▶

Embedded Computer ▶ Single Board Computer ▶ Embedded Board

3.5" SBC supports Intel® 8th Generation Whiskey Lake processor with DDR4 SO-DIMM, Triple display with dual HDMI 1.4, LVDS, Triple GbE, USB 3.1 Gen2, M.2 A key, mPCIe with mSATA support, SATA 6Gb/s, COM and RoHS

Driver

File Name	Published	Version	File Checksum
WAFER-ULT5-R10_V1.1.iso (1.97 GB)	2020/07/07	1.10	475FD74C87A309D22A0265218DD3B37E

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 click the small arrow to find an individual driver and click the file name to download (❷).

WAFER-ULT5-R10_V1.1.iso X

❶ Click here to download entire ISO file. (1.97 GB)

* Download individual file *

❷ Docs

- 1. Chipset
- 10.1.18019.8144.zip (3.26 MB)
- 2. VGA
- 3. LAN
- 4. Audio
- 5. ME
- 6. RST
- 7. SIO
- 8. Manual
- Thumbs.db (19.5 KB)



NOTE:

To install software from the downloaded ISO image file in Windows 8, 8.1 or 10, double-click the ISO file to mount it as a virtual drive to view its content.

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

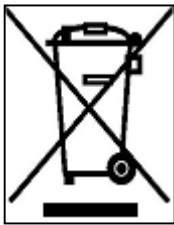
Product Disposal

WAFER-JL-N5105 SBC**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

WAFER-JL-N5105 SBC

D.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	DXE IPL was not found
3	DXE Core Firmware Volume was not found
4	Recovery failed
4	S3 Resume failed
7	Reset PPI is not available

D.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.