IEI Integration Corp.

MODEL:

WAFER-RK3588

3.5" SBC with Rockchip RK3588 Processors, 8GB LPDDR4x Memory, 32GB eMMC NAND Flash, Single HDMI Input and Dual HDMI Output, 2.5GbE LAN, GbE LAN, USB 3.2 Gen 1, USB 2.0, 0°C ~60°C and RoHS

User Manual

Rev. 1.00 - September 8, 2023

RoHS Lead Free

Revision

Date	Version	Changes
September 8, 2023	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
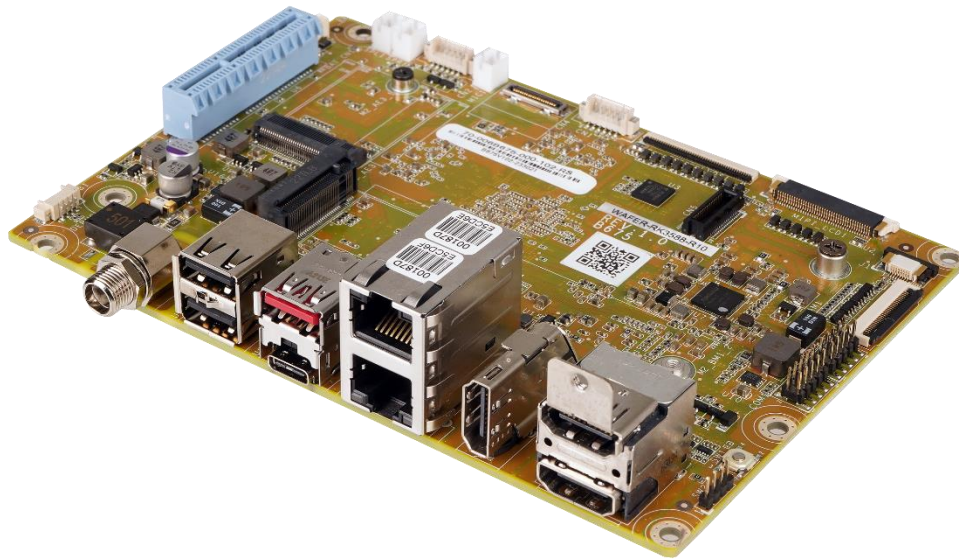
   Figure 1-1: WAFER-RK3588

The WAFER-RK3588 series is a 3.5" form factor single bard computer. It has an on-board Rockchip RK3588 which is an octa-core processor that features four Cortex®-A76 cores, four Cortex®-A55 cores, a Neural Processing Unit (NPU) operating at up to 6.0 TOPS, and a 4-core GPU. It is also pre-installed with 8 GB LPDDR4x memory, and 32 GB eMMC NAND flash.

The WAFER-RK3588 series equips multiple display IO, including 4K HDMI input, 8K HDMI output, LVDS, and MIPI DSI. 4-lane MIPI CSI interface is also integrated for camera connection.

Expansion and I/O include one PCIe x2 slot, two M.2 slots, one connector for optional Wi-Fi/Bluetooth module, three USB Type-A connectors, one USB Type-C connector and one SATA 6Gb/s for additional storage requirement. Serial device connectivity is provided by two internal UART connectors. Two RJ-45 LAN connectors provide the system with smooth connections to an external LAN.

1.2 Model Variations

The model variations of the WAFER-RK3588 series are listed below.

Model No.	Processor	OS
WAFER-RK3588-A/CE	Rockchip RK3588	Android 13
WAFER-RK3588-D/CE	Rockchip RK3588	Debian 11

Table 1-1: WAFER-RK3588 Model Variations

1.3 Features

Some of the WAFER-RK3588 motherboard features are listed below:

- Rockchip RK3588 processor with quad-core Cortex-A76 and quad-core Cortex-A55, up to 2.4GHz
- Built-in AI accelerator NPU with processing performance of up to 6.0 TOPS, supporting int4, int8, int16, FP16, BF16 and TF32
- Built-in 4-core GPU Mali G610 (4 x 256KB L2 cache) supports OpenGLES3.2, OpenCL2.2 and Vulkan1.1
- Multi-channel input & output: 4K HDMI input, 8K HDMI output, LVDS, MIPI DSI, and MIPI CSI camera input
- Rich I/O: 2.5GbE, GbE, USB 3.2 Gen 1, USB 2.0
- Expansion slot: PCIe 3.0 x2, M.2 B/M key, M.2 A/E key
- Optional Wi-Fi 5, Wi-Fi 6 & Bluetooth 5.0
- Supported OS: Android 13 / Debian 11 (Linux Kernel 5.10)

1.4 Connectors

The connectors on the WAFER-RK3588 are shown in the figure below.
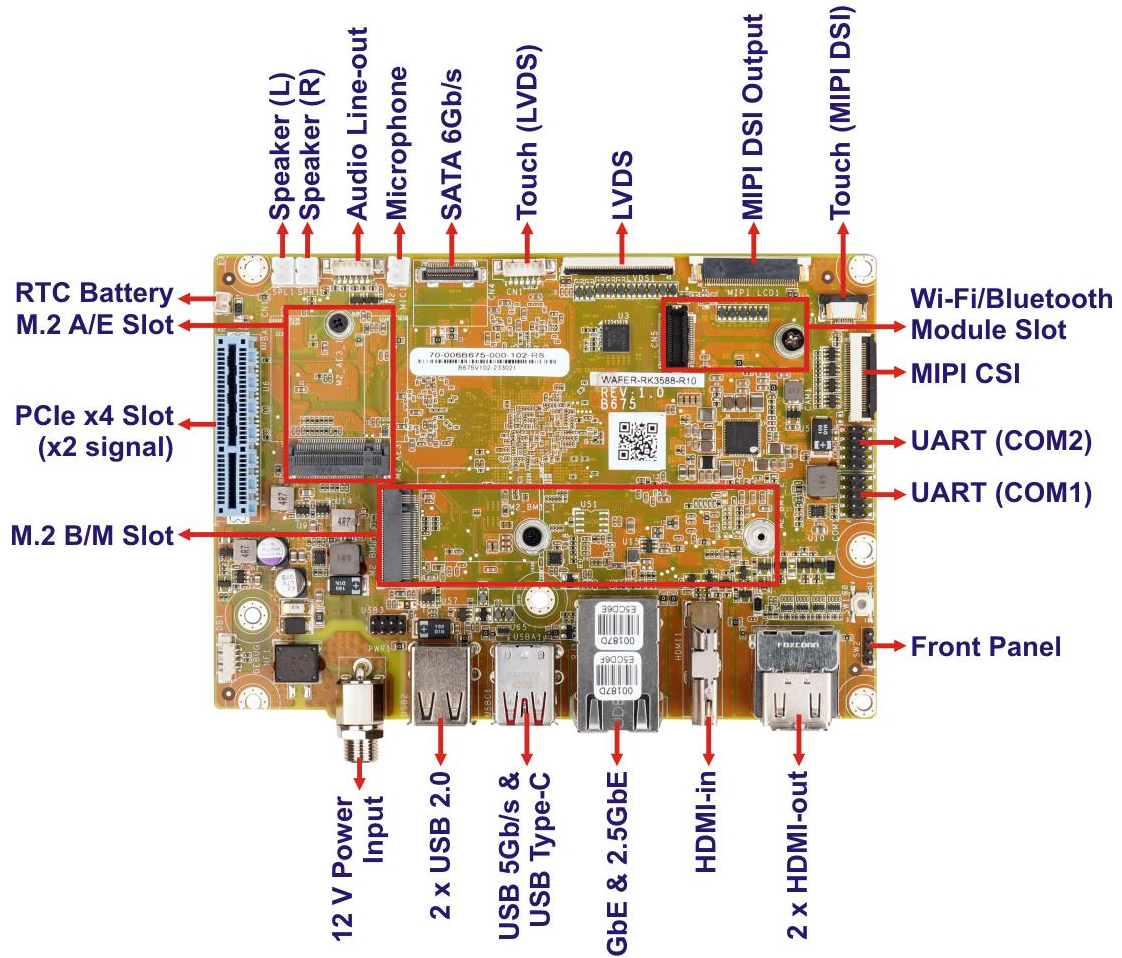
Figure 1-2: Connectors

1.5 Dimensions

The dimensions of the board are listed below:
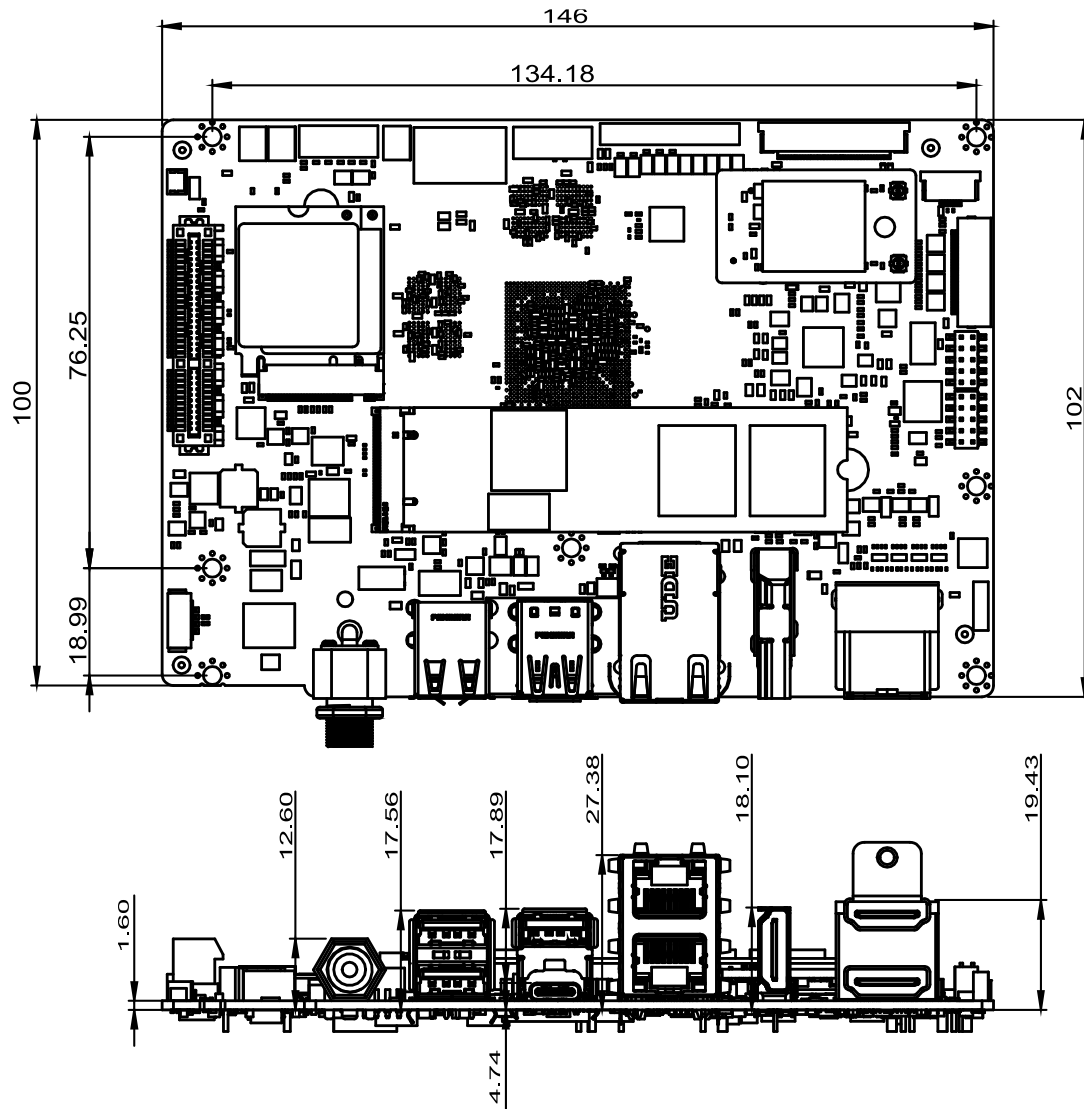
Figure 1-3: Dimensions (mm)

1.6 Data Flow

Figure 1-4 shows the data flow between the system chipset, the CPU and other components installed on the motherboard.
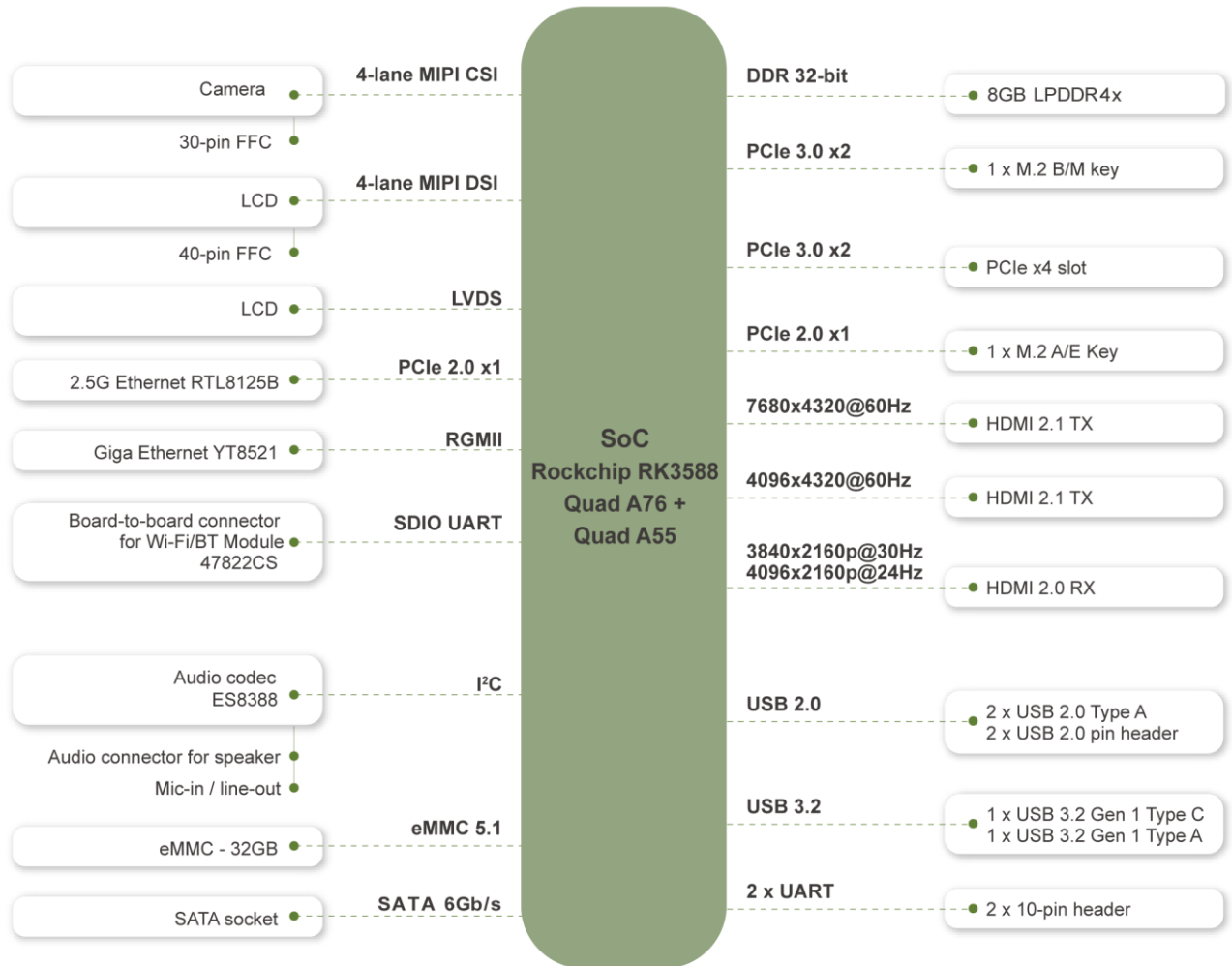
Figure 1-4: Data Flow Diagram

1.7 Technical Specifications

WAFER-RK3588 technical specifications are listed below.

Specification	WAFER-RK3588
Processor	Rockchip RK3588 (quad-core Cortex®-A76 + quad-core Cortex®A55)
GPU	Arm Mali-G610 MP4
NPU	6 TOPS, supports int4, int8, int16, FP16, BF16 and TF32
RAM	On-board 8GB LPDDR4x
Flash	32 GB eMMC NAND Flash for OS and IEI's boot loader
Audio	Pin header to mic-in & line-out jacks
Speaker	2 x Speaker output (2-pin header)
Display	1 x MIPI DSI 1 x LVDS out
HDMI	1 x HDMI-input up to 4K@60FPS 1 x HDMI-output up to 8K@60Hz 1 x HDMI-output up to 4K@60Hz
Camera	1 x MIPI CSI
Wi-Fi	Wi-Fi 5/6 (optional board-to-board IEI module)
Bluetooth	Support Bluetooth v5.0
I/O Interface	1 x GbE LAN 1 x 2.5GbE LAN 1 x USB 3.2 Gen 1 Type-C with DP (OS update) 1 x USB 3.2 Gen 1 Type-A 2 x USB 2.0 Type-A 2 x UART (2x9 pin header) 1 x SATA 6Gb/s 1 x DC jack

Specification	WAFER-RK3588
Expansion	1 x PCIe 3.0 x2 1 x M.2 2230/2280 B/M key (PCIe 3.0 x2) 1 x M.2 2230 A/E key (PCIe 2.0 x1)
Dimensions (LxW)	146 mm x 102 mm
Power Input	12 V DC
Operating Temperature	0°C – 60°C
Storage Temperature	-20°C – 60°C
Relative Humidity	5% – 95%, non-condensing
EMC & Safety	EMC Class B
Supported OS	Android 13 / Debian 11 (Linux kernel 5.10)

Table 1-2: Technical Specifications

Chapter

2

Unpacking

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-RK3588 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 icon] **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-RK3588 was purchased from or contact an IEI sales representative directly by sending an email to sales@ieiworld.com.

The WAFER-RK3588 is shipped with the following components:

Quantity	Item and Part Number	Image
1	WAFER-RK3588 single board computer	
1	Quick installation guide	

2.4 Optional Items

The following are optional components which may be separately purchased:

Item and Part Number	Image
10.1" color TFT-LCD with projected capacitive touch (800x1280, 340 cd/m^2, LED, RoHS) (**P/N** : 23T00-01010AW01-RS)	
Camera module (2592x1944, 1/4", 8.5x15.8x5.45mm, sensor type: OV5640, RoHS) (**P/N**: 7I001-COC794A5SFE-RS)	
Speakers with cables (Speakers: 28x28x13.6mm, 4Ω, 3W; cable: 250mm; RoHS) (**P/N**: 30400-000188-RS)	
Wi-Fi & Bluetooth module (AP6275S, 2T2R, 802.11 a/b/g/n/ac/ax Wi-Fi + BT 5.0, RoHS) (**P/N**: iWB-BCM43752-R10)	
Wi-Fi & Bluetooth module (2-stream 802.11ac, 2T2R, Bluetooth 5.0, RoHS) (**P/N**: iWB-RTL8822-R10)	

Chapter

3

Connectors

3.1 Peripheral Interface Connectors

This chapter details all the jumpers and connectors.

3.1.1 WAFER-RK3588 Layout

The figures below show all the connectors and jumpers.
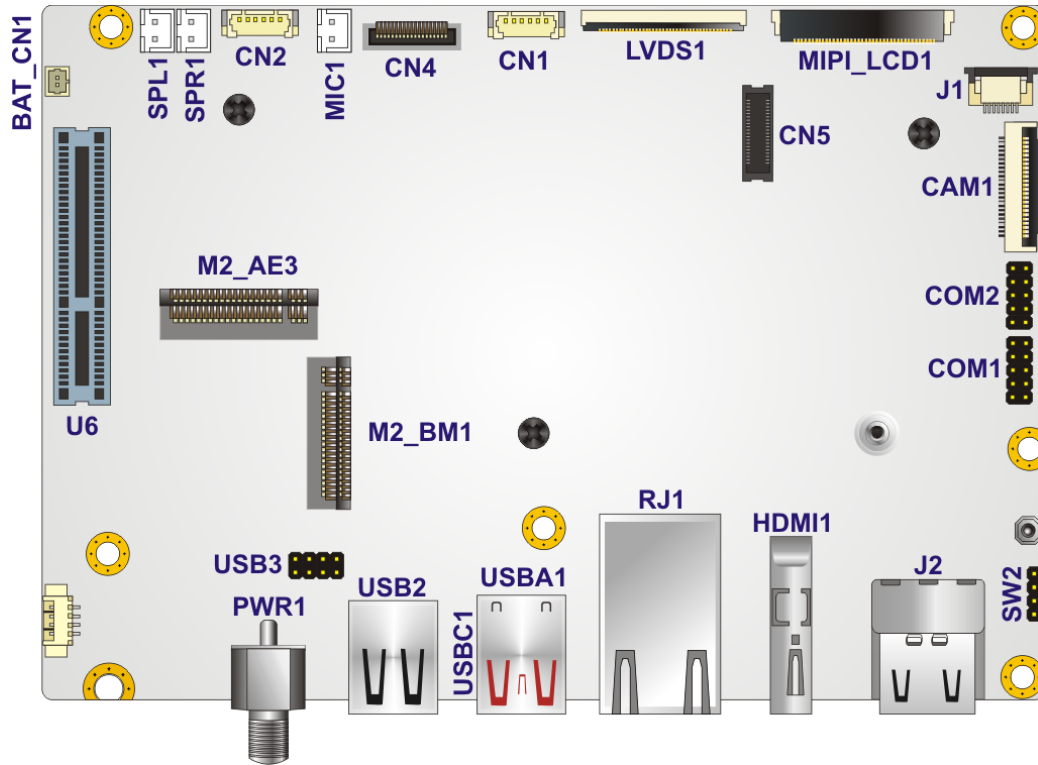
Figure 3-1: Connector and Jumper Locations

3.1.2 Peripheral Interface Connectors

The table below lists all the connectors on the board.

Connector	Type	Label
Audio line-out connector	6-pin wafer	CN2
Audio mic-in connector	2-pin wafer	MIC1
RTC battery connector	2-pin wafer	BAT_CN1
LVDS connector	45-pin FPC	LVDS1
M.2 A/E key slot	M.2 A key 2230	M2_AE3
M.2 B/M key slot	M.2 M key 2230/2280	M2_BM1
MIPI DSI output connector	40-pin FPC	MIPI_LCD1
MIPI CSI connector	30-pin FPC	CAM1
PCIe x4 slot (x2 signal)	PCIe x4 slot	U6
Front panel connector	4-pin header	SW2
SATA 6Gb/s connector	20-pin connector	CN4
Speaker connectors	2-pin wafer	SPL1, SPR1
Touch panel connector (LVDS)	6-pin wafer	CN1
Touch panel connector (MIPI DSI)	8-pin FPC	J1
UART connectors	10-pin header	COM1, COM2
USB 2.0 connector	8-pin header	USB3
Wi-Fi/Bluetooth module slot	40-pin connector	CN5
Debug port (IEI internal use only)	4-pin wafer	DB1
Maintenance button (IEI internal use only)	Button	SW1

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
DC power input connector	DC jack	PWR1
HDMI output connectors	Dual HDMI	J2
HDMI input connector	HDMI	HDMI1
LAN connectors	Dual RJ-45	RJ1
USB 2.0 connectors	Dual USB Type-A	USB2
USB 5Gb/s connector	USB Type-A	USBA1
USB Type-C connector	USB Type-C	USBC1

Table 3-2: Rear Panel Connectors

3.2 Internal Peripheral Connectors

The section describes all of the connectors on the WAFER-RK3588.

3.2.1 Audio Line-out Connector

CN Label:	**CN2**
CN Type:	6-pin wafer, p=1.25 mm
CN Location:	See **Figure 3-2**
CN Pinouts:	See **Table 3-3**

This connector provides audio output to an external audio device.
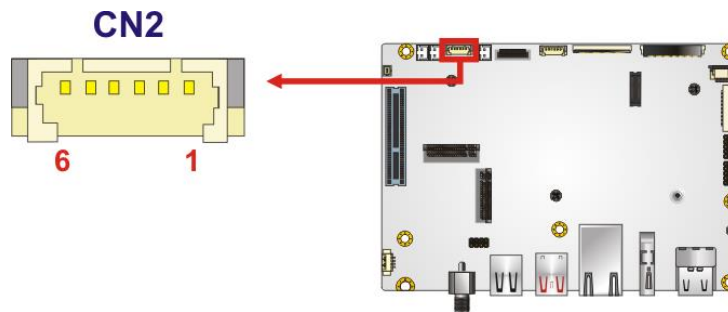
Figure 3-2: Audio Line-out Location

Pin	Description
1	GND
2	HP-OUT_R
3	HP-OUT_L
4	MIC-IN
5	HP_DET
6	GND

Table 3-3: Audio Line-out Pinouts

3.2.1 Audio Mic-in Connector

CN Label:	**MIC1**
CN Type:	2-pin wafer, p=1.25 mm
CN Location:	See **Figure 3-3**
CN Pinouts:	See **Table 3-4**

This connector provides audio input from a microphone.
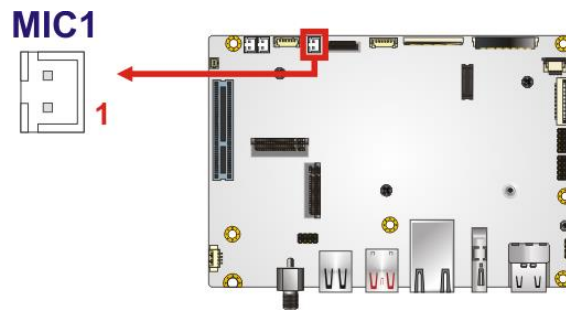
Figure 3-3: Audio Mic-in Location

Pin	Description
1	MIC_P
2	MIC_N

Table 3-4: Audio Mic-in Pinouts

3.2.1 RTC Battery Connector

![Warning triangle] **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.

CN Label:	**BAT_CN1**
CN Type:	2-pin wafer
CN Location:	See **Figure 3-4**
CN Pinouts:	See **Table 3-5**

The battery connector is connected to an RTC battery. The battery provides power to the system clock to retain the time when power is turned off. **NOTE:** It is recommended to attach the RTC battery onto the system chassis in which the WAFER-RK3588WAFER-RK3588WAFER-RK3588 WAFER-RK3588is installed.
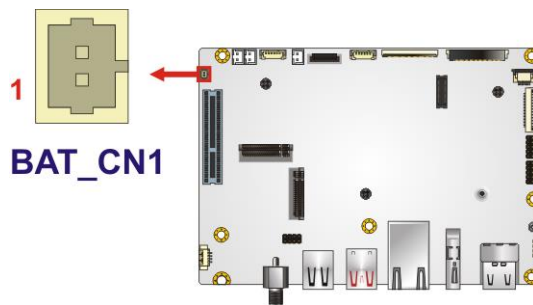
Figure 3-4: Battery Connector Location

Pin	Description
1	Battery+
2	Ground

Table 3-5: Battery Connector Pinouts

3.2.1 LVDS LCD Connector

CN Label:		LVDS1
CN Type:		45-pin FPC (1x45)
CN Location:		See **Figure 3-5**
CN Pinouts:		See **Table 3-6**

The LVDS connector is for an LCD panel connected to the board.
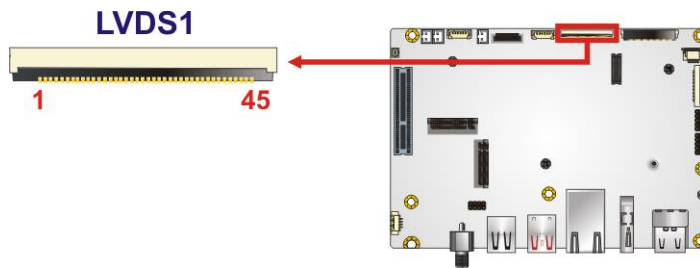
Figure 3-5: LVDS Connector Location

Pin	Description	Pin	Description
1	LCD_3V3	23	ODD_3N
2	3V3	24	ODD_3P
3	3V3	25	GND
4	3V3	26	EVEN_0N
5	3V3	27	EVEN_0P
6	N/C	28	GND
7	N/C	29	EVEN_1N
8	N/C	30	EVEN_1P
9	N/C	31	GND
10	GND	32	EVEN_CLKN
11	ODD_0N	33	EVEN_CLKP
12	ODD_0P	34	GND
13	GND	35	EVEN_2N
14	ODD_1N	36	EVEN_2P
15	ODD_1P	37	GND
16	GND	38	EVEN_3N

Pin	Description	Pin	Description
17	ODD_CLKN	39	EVEN_3P
18	ODD_CLKP	40	GND
19	GND	41	N/C
20	ODD_2N	42	LED+
21	ODD_2P	43	LED+
22	GND	44	LED-
		45	LED-

Table 3-6: LVDS Connector Pinouts

3.2.2 M.2 A/E Key Slot

CN Label:	**M2_AE3**
CN Type:	M.2 A key 2230 slot
CN Location:	See **Figure 3-6**

The M.2_AE3 slot is keyed in the A position and accepts 2230 size of M.2 modules. The M.2 slot supports PCIe 2.0 x1 interface only.
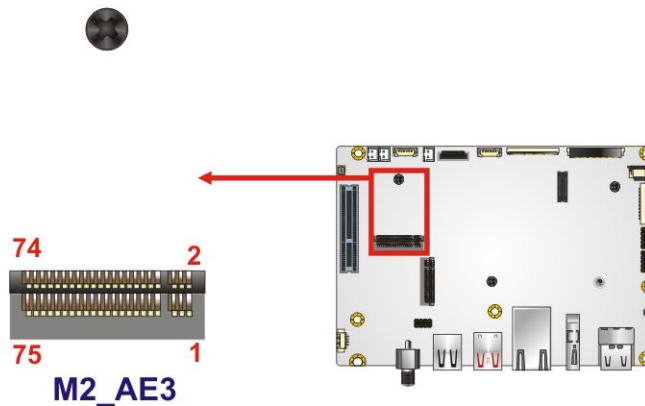
Figure 3-6: M.2 A/E Key Slot Location

3.2.3 M.2 B/M Key Slot

CN Label: **M2_BM1**

CN Type: M.2 M key 2230/2280 slot

CN Location: See **Figure 3-7**

The M.2 slot is keyed in the M position and provides two positions for the mounting screw, accepting 2230 and 2280 sizes of M.2 modules. The M.2 slot supports PCIe 3.0 x2 interface only.
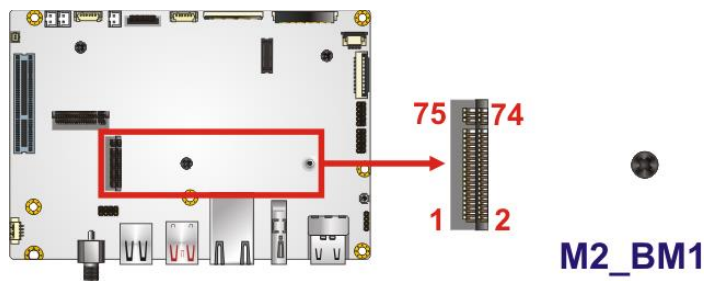
Figure 3-7: M.2 B/M Key Slot Location

3.2.4 MIPI DSI Output Connector

CN Label: **MIPI_LCD1**

CN Type: 40-pin FPC, p=0.5 mm

CN Location: See **Figure 3-8**

CN Pinouts: See **Table 3-7**

The MIPI DSI connector is for an LCD panel to connect to the board for display output.
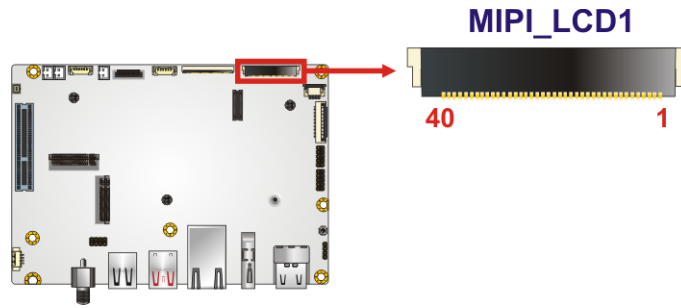
Figure 3-8: MIPI DSI Output Connector Location

Pin	Description	Pin	Description
1	LED+	21	DN3
2	LED+	22	GND
3	N/C	23	DP2
4	N/C	24	DN2
5	N/C	25	GND
6	N/C	26	CLKP
7	N/C	27	CLKN
8	N/C	28	GND
9	LED-	29	DP1
10	LED-	30	DN1
11	GND	31	GND
12	N/C	32	DP0
13	N/C	33	DN0
14	N/C	34	GND
15	N/C	35	N/C
16	GND	36	RESET
17	N/C	37	N/C
18	N/C	38	3V3
19	GND	39	3V3
20	DP3+	40	N/C

Table 3-7: MIPI DSI Output Connector Pinouts

3.2.5 MIPI CSI Connector

CN Label:	**CAM1**
CN Type:	30-pin FPC, p=0.5 mm
CN Location:	See **Figure 3-9**
CN Pinouts:	See **Table 3-8**

The MIPI CSI connector is used to connect to a camera module.
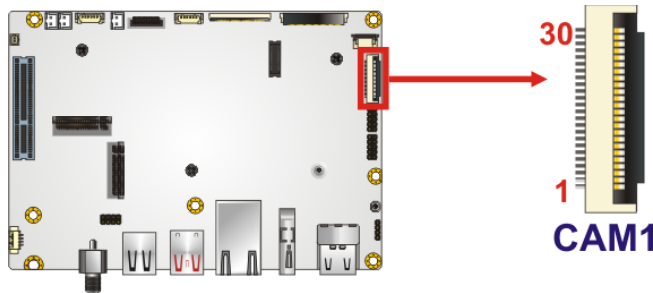
Figure 3-9: MIPI CSI Connector Location

Pin	Description	Pin	Description
1	LED-	16	MDP2
2	LED+	17	MDN2
3	N/C	18	RESET
4	DGND	19	MDP3
5	N/C	20	MDN3
6	DGND	21	NC
7	MDP1	22	SDA
8	MDN1	23	SCL
9	DGND	24	PWDN
10	MCP	25	MCLK
11	MCN	26	DVDD_1V5
12	DGND	27	DOVDD_1V8
13	MDP0	28	AGND
14	MDN0	29	AVDD_2V8
15	DGND	30	DGND

Table 3-8: MIPI CSI Connector Pinouts

3.2.1 PCIe x4 Slot (x2 Signal)

CN Label:	**U6**
CN Type:	PCIe x4 slot
CN Location:	See **Figure 3-10**

The slot provides PCIe x2 through a PCIe x4 interface.
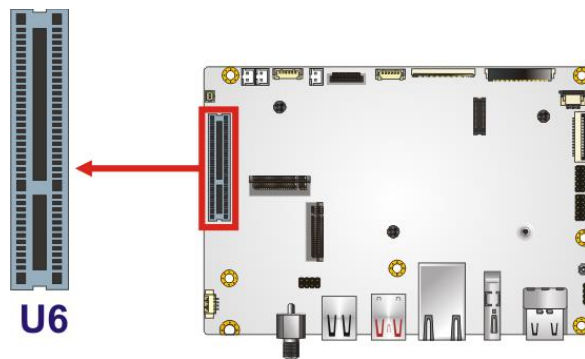
Figure 3-10: PCIe x4 Slot Location

3.2.2 Front Panel Connector

CN Label: SW2

CN Type: 4-pin header, p=2.0mm

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

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

The front panel connector connects to the power button and reset button on the computer's front panel.
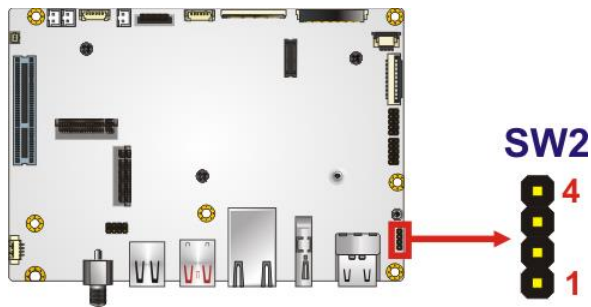
Figure 3-11: Front Panel Connector Location

Pin	Description
1	GND
2	RESET
3	GND
4	PWR_ON

Table 3-9: Front Panel Connector Pinouts

3.2.3 SATA 6Gb/s Connector

CN Label:	**CN4**
CN Type:	20-pin connector
CN Location:	See **Figure 3-12**
CN Pinouts:	See **Table 3-10**

The SATA connectors connect to SATA hard drives and provides 5V SATA power.
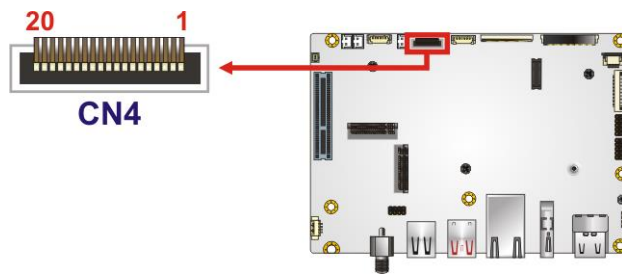
Figure 3-12: SATA Drive Connector Location

Pin	Description	Pin	Description
1	GND	11	5V0
2	GND	12	N/C
3	GND	13	N/C
4	GND	14	GND
5	GND	15	SATA_RXP
6	N/C	16	SATA_RXN
7	5V0	17	GND
8	5V0	18	SATA_TXN
9	5V0	19	SATA_TXP
10	5V0	20	GND

Table 3-10: SATA Drive Connector Pinouts

3.2.4 Speaker Connectors

CN Label: **SPL1, SPR1**

CN Type: 2-pin wafer

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

CN Pinouts: See **Table 3-11** and **Table 3-12**

This connectors provide audio output to speakers.
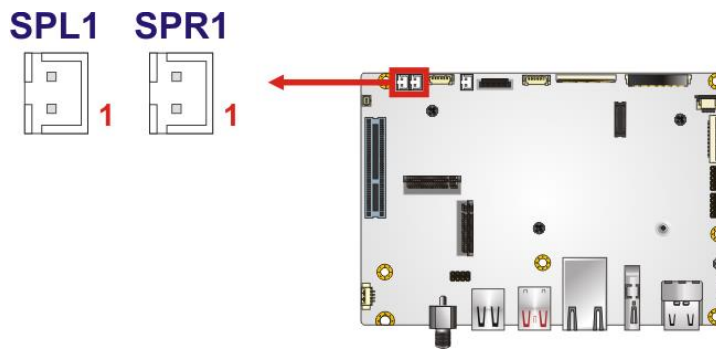
Figure 3-13: Speaker Connector Locations

Pin	Description
1	SPK_OUT_L_N
2	SPK_OUT_L_P

Table 3-11: Speaker Connector (SPL1) Pinouts

Pin	Description
1	SPK_OUT_R_P
2	SPK_OUT_R_N

Table 3-12: Speaker Connector (SPR1) Pinouts

3.2.1 Touch Panel Connector (LVDS)

CN Label: CN1

CN Type: 6-pin wafer, p=1.25 mm

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

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

The touch connector is used to connect a touch panel for LVDS LCD.
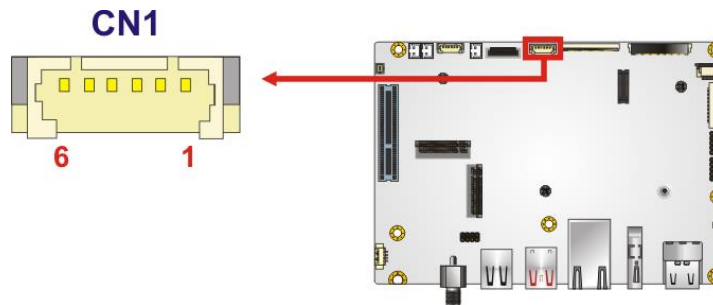
Figure 3-14: LVDS Touch Panel Connector Location

Pin	Description
1	3V3
2	SCL
3	SDA
4	RESET
5	INT
6	GND

Table 3-13: LVDS Touch Panel Connector Pinouts

3.2.1 Touch Panel Connector (MIPI DSI)

CN Label: J1

CN Type: 8-pin FPC, p=0.5 mm

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

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

The touch connector is used to connect a touch panel for MIPI-DSI LCD.
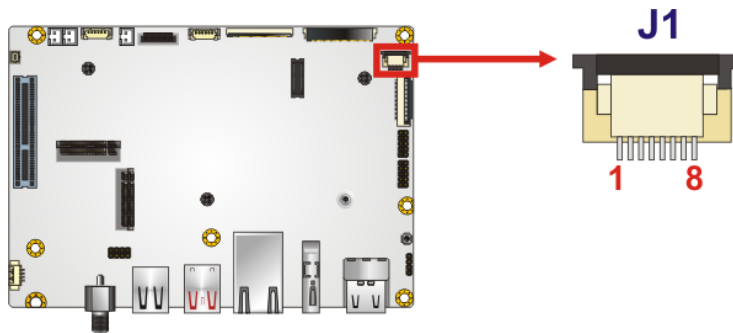
Figure 3-15: MIPI-DSI Touch Panel Connector Location

Pin	Description
1	GND
2	N/C
3	+3.3V
4	I2C_SCL
5	I2C_SDA
6	TP_INT_L
7	TP_RST_L
8	GND

Table 3-14: MIPI-DSI Touch Panel Connector Pinouts

3.2.2 UART Connectors

CN Label:	COM1, COM2
CN Type:	10-pin header p=2.0 mm
CN Location:	See **Figure 3-16**
CN Pinouts:	See **Table 3-15**

This connector provides RS-232 communications.
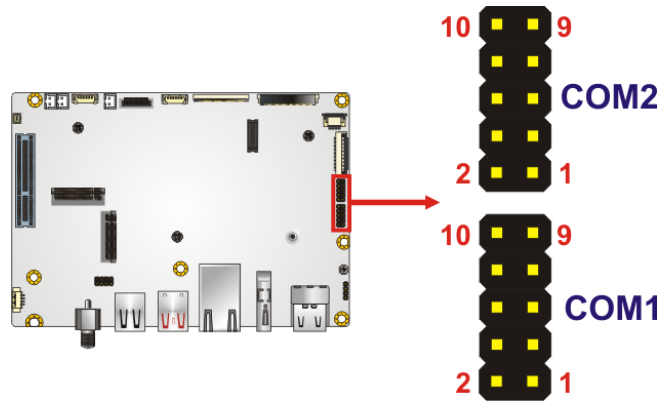
Figure 3-16: UART Connector Locations

Pin	Description	Pin	Description
1	N/C	2	N/C
3	RXD	4	RTS
5	TXD	6	CTS
7	N/C	8	N/C
9	GND	10	N/C

Table 3-15: UART Connector Pinouts

3.2.3 USB 2.0 Connector

CN Label:	**USB3**
CN Type:	8-pin header p=2.0 mm
CN Location:	See **Figure 3-17**
CN Pinouts:	See **Table 3-16**

The WAFER-RK3588 has one USB Type-C port. The pinouts are shown below.
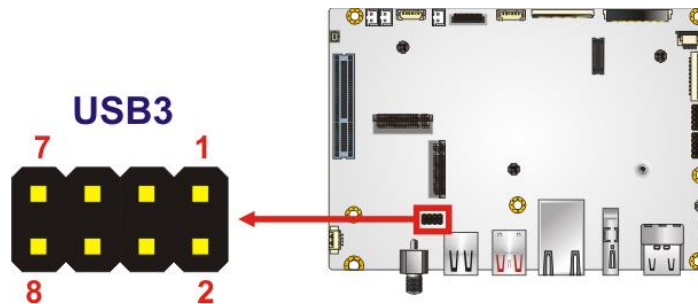
Figure 3-17: USB Type-C Port Pinouts

Pin	Description	Pin	Description
1	USB 5V	2	GND
3	USB_D-	4	USB_D+
5	USB_D+	6	USB_D-
7	GND	8	USB 5V

Table 3-16: USB Type-C Port Pinouts

3.2.4 Wi-Fi/Bluetooth Module Slot

CN Label:	**CN5**
CN Type:	40-pin connector
CN Location:	See **Figure 3-18**
CN Pinouts:	See **Table 3-17**

The slot supports IEI's Wi-Fi/Bluetooth modules.
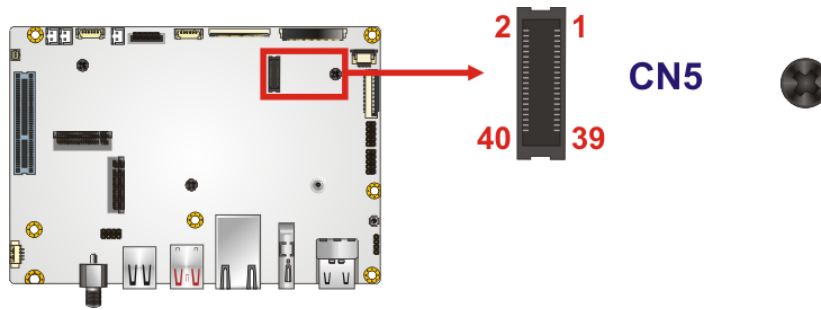
Figure 3-18: Wi-Fi/Bluetooth Module Slot Location

Pin	Description	Pin	Description
1	GND	2	GND
3	BT_RTS	4	WIFI_DATA0
5	BT_TXD	6	WIFI_DATA1
7	BT_RXD	8	WIFI_DATA2
9	BT_CTS	10	WIFI_DATA3
11	GND	12	WIFI_CMD
13	BT_LRCK	14	WIFI_CLK
15	BT_SDO	16	GND
17	N/C	18	WIFI_REG_ON_H
19	BT_SDI	20	WIFI_HOST_WAKE
21	GND	22	BT_HOST_WAKE
23	BT_SCLK	24	BT_WAKE
25	GND	26	BT_REG_ON_H
27	GND	28	WLAN_PEN
29	N/C	30	GND
31	WIFI_3V3	32	WIFI_GPIO
33	WIFI_3V3	34	WIFI_GPIO
35	WIFI_3V3	36	GND
37	WIFI_3V3	38	GND
39	N/C	40	GND

Table 3-17: Wi-Fi/Bluetooth Module Slot Pinouts

3.3 External Peripheral Interface Connector Panel

Figure 3-19 shows the WAFER-RK3588 external peripheral interface connector (EPIC) panel. The EPIC panel consists of the following:

- 1 x 12V DC power input connector
- 1 x HDMI input connector
- 2 x HDMI output connector
- 1 x GbE RJ-45 connector
- 1 x 2.5GbE RJ-45 connector
- 2 x USB 2.0 connector
- 1 x USB 3.2 Gen 1 (5Gb/s) connector
- 1 x USB Type-C connector
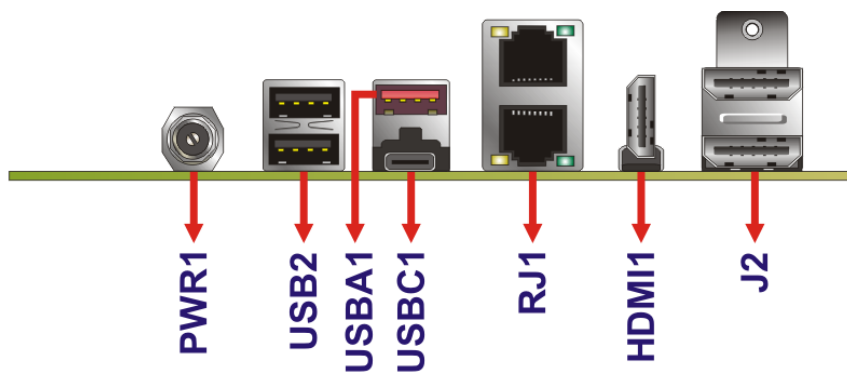
Figure 3-19: External Peripheral Interface Connector

3.3.1 DC Power Input Connector

CN Label:	PWR1

CN Label: | PWR1

CN Type: | DC jack

CN Location: | See **Figure 3-19**

CN Pinouts: | See **Table 3-18** and **Figure 3-20**

The connector supports 12V power DC input.

Pin	Description
1	DC_12V
2	GND
3	GND

Table 3-18: Power Input Connector Pinouts

Figure 3-20: Power Input Connector

3.3.2 HDMI Output Connectors

CN Label:	J2
CN Type:	Dual HDMI connector
CN Location:	See **Figure 3-19**
CN Pinouts:	See **Table 3-19** and **Figure 3-21**

The HDMI connectors can connect to HDMI devices for video output.

Pin	Description	Pin	Description
1	HDMI_DATA2	2	GND
3	HDMI_DATA2#	4	HDMI_DATA1
5	GND	6	HDMI_DATA1#
7	HDMI_DATA0	8	GND
9	HDMI_DATA0#	10	HDMI_CLK
11	GND	12	HDMI_ CLK#
13	N/C	14	N/C
15	HDMI_SCL	16	HDMI_SDA
17	GND	18	+5V
19	HDMI_HPD		

Table 3-19: HDMI Output Connector Pinouts
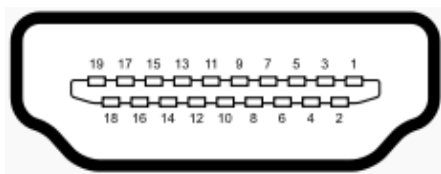
Figure 3-21: HDMI Connector Pinout Locations

3.3.1 HDMI Input Connector

CN Label:	**HDMI1**	
CN Type:	HDMI connector	
CN Location:	See **Figure 3-19**	
CN Pinouts:	See **Table 3-19** and **Figure 3-21**	

The HDMI connector can be connected for video input.

Pin	Description	Pin	Description
1	HDMI_DATA2	2	GND
3	HDMI_DATA2#	4	HDMI_DATA1
5	GND	6	HDMI_DATA1#
7	HDMI_DATA0	8	GND
9	HDMI_DATA0#	10	HDMI_CLK
11	GND	12	HDMI_ CLK#
13	N/C	14	N/C
15	HDMI_SCL	16	HDMI_SDA
17	GND	18	+5V
19	HDMI_HPD		

Table 3-20: HDMI Input Connector Pinouts
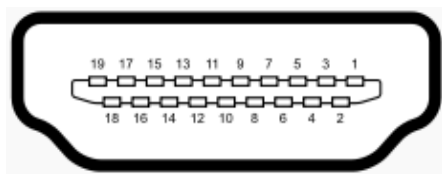
Figure 3-22: HDMI Connector Pinout Locations

3.3.2 LAN Connectors

CN Label:	**RJ1**	
CN Type:	RJ-45	
CN Location:	See **Figure 3-19**	
CN Pinouts:	See **Figure 3-23** and **Table 3-21**	

The LAN connectors connect to a local network. The upper port provides up to 1 gigabit speed, and the bottom port provides up to 2.5 gigabit speed.

Pin	Description	Pin	Description
1	MDIA0+	5	MDIA2-
2	MDIA0-	6	MDIA1-
3	MDIA1+	7	MDIA3+
4	MDIA2+	8	MDIA3-

Table 3-21: LAN Pinouts
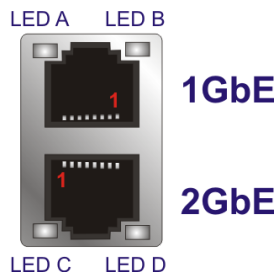
Figure 3-23: LAN Connector

LED	Description	LED	Description
A / C	on: linked blinking: data is being sent/received	B / D	off: 10 Mb/s or 2500 Mb/s orange: 100 Mb/s green: 1000 Mb/s

Table 3-22: LAN Connector LEDs

3.3.1 USB 2.0 Connectors

CN Label:	**USB2**
CN Type:	USB Type-A
CN Location:	See **Figure 3-19**
CN Pinouts:	See **Table 3-23**

The USB 2.0 connectors can be connected to USB devices.

Pin	Description	Pin	Description
1	5 V	5	5 V
2	Data1-	6	Data1-
3	Data1+	7	Data1+
4	GND	8	GND

Table 3-23: USB Port Pinouts

Figure 3-24: USB 2.0 Port Pinout Locations

3.3.2 USB 5Gb/s Connectors

CN Label: **USBA1**

CN Type: USB Type-A

CN Location: See **Figure 3-19**

CN Pinouts: See **Table 3-24** and **Figure 3-25**

The WAFER-RK3588 has one external USB 5Gb/s port. The USB connector can be connected to a USB 2.0 or USB 5Gb/s device. The pinouts of USB 5Gb/s connectors are shown below.

Pin	Description	Pin	Description
1	USB_VCC	10	USB_VCC
2	USB2_D0-	11	USB2_D0-
3	USB2_D0+	12	USB2P0_D0+
4	GND	13	GND
5	USB3P0_RXDN1	14	USB3P0_RXDN2
6	USB3P0_RXDP1	15	USB3P0_RXDP2
7	GND	16	GND
8	USB3P0_TXDN1	17	USB3P0_TXDN2
9	USB3P0_TXDP1	18	USB3P0_TXDP2

Table 3-24: USB 5Gb/s Port Pinouts

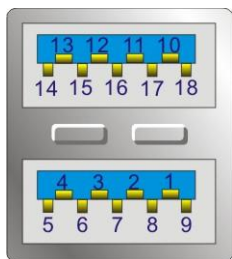**Figure 3-25: USB 5Gb/s Port Pinouts**

3.3.1 USB Type-C Connector

CN Label: USBC1

CN Type: USB Type-C

CN Location: See **Figure 3-19**

CN Pinouts: See Table 3-25 and **Figure 3-26**

The WAFER-RK3588 has one USB Type-C port. The pinouts are shown below.

Pin	Description	Pin	Description
A1	GND	B12	GND
A2	USB_C_TXP	B11	USB_C_RXP
A3	USB_C_TXN	B10	USB_C_RXN
A4	USB_C_5V	B9	USB_C_5V
A5	USB_CC1	B8	N/C
A6	USB_C_DP	B7	USB_C_DN
A7	USB_C_DN	B6	USB_C_DP
A8	N/C	B5	USB_CC2
A9	USB_C_5V	B4	USB_C_5V
A10	USB_C_RXN	B3	USB_C_TXN
A11	USB_C_RXP	B2	USB_C_TXP
A12	GND	B1	GND

Table 3-25: USB Type-C Port Pinouts

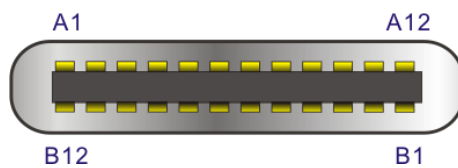**Figure 3-26: USB Type-C Port Location**

Chapter

4

Installation

4.1 Anti-static Precautions

WARNING:

Failure to take ESD precautions during the installation of the WAFER-RK3588 may result in permanent damage to the WAFER-RK3588 and severe injury to the user.

Electrostatic discharge (ESD) can cause serious damage to electronic components, including the WAFER-RK3588. Dry climates are especially susceptible to ESD. It is therefore critical that whenever the WAFER-RK3588 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-RK3588, place it on an anti-static pad. This reduces the possibility of ESD damaging the WAFER-RK3588.
- **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 icon] **WARNING:**

The installation instructions described in this manual should be carefully followed in order to prevent damage to the WAFER-RK3588, WAFER-RK3588 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-RK3588 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-RK3588 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-RK3588 off:
  - When working with the WAFER-RK3588, 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-RK3588 **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 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 20º (Figure 4-1).
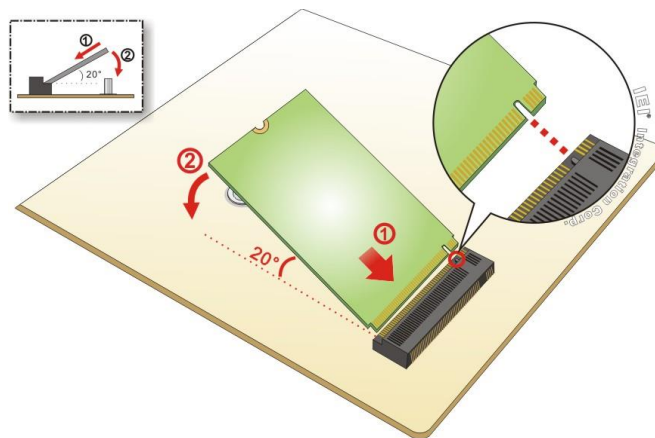

Figure 4-1: Inserting the M.2 Module into the Slot at an Angle

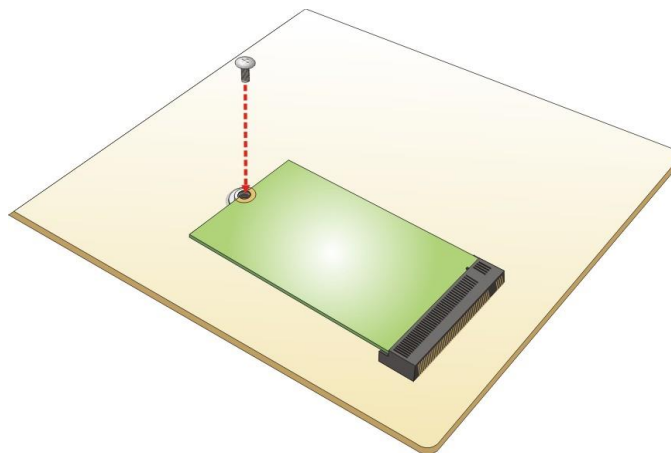**Step 4:** Secure the M.2 module with the previously removed retention screw (Figure 4-2).

Figure 4-2: Securing the M.2 Module

4.4 Chassis Installation

4.4.1 Airflow

![WARNING icon] **WARNING:**

Airflow is critical for keeping components within recommended operating temperatures. The chassis should have fans and vents as necessary to keep things cool.

The WAFER-RK3588 must be installed in a chassis with ventilation holes on the sides allowing airflow to travel through the heat sink surface. In a system with an individual power supply unit, the cooling fan of a power supply can also help generate airflow through the board surface.

4.4.2 Motherboard Installation

To install the WAFER-RK3588 motherboard into the chassis please refer to the reference material that came with the chassis.

Chapter

5

Software Drivers

5.1 Available Drivers

All the drivers for the WAFER-RK3588 are available on IEI Resource Download Center (https://download.ieiworld.com). Type WAFER-RK3588 and press Enter to find all the relevant software, utilities, and documentation.
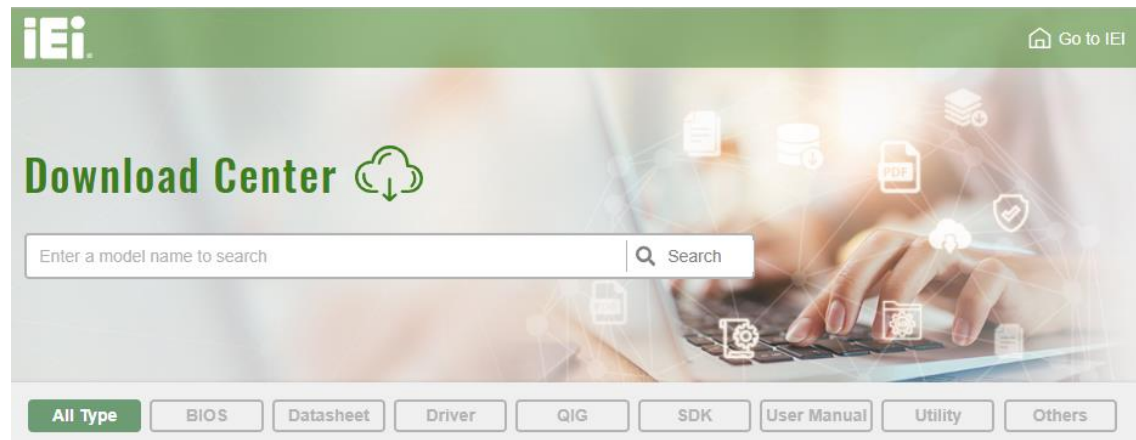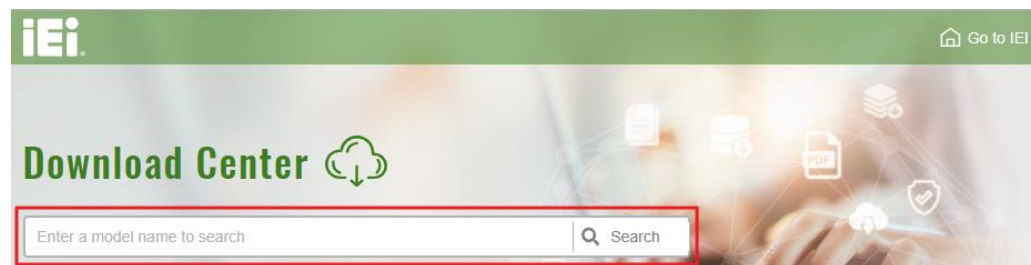

Figure 5-1: IEI Resource Download Center

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-RK3588 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 click the small arrow to find an individual driver and click the file name to download (❷).

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

⚠️ **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.
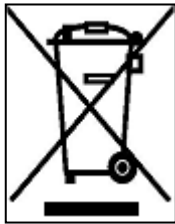
EU-wide legislation, as implemented in each Member State, requires that waste electrical and electronic products carrying the mark (left) must be disposed of separately from normal household waste. This includes monitors and electrical accessories, such as signal cables or power cords. When you need 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

Hazardous Materials Disclosure

C.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.										

C.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。						