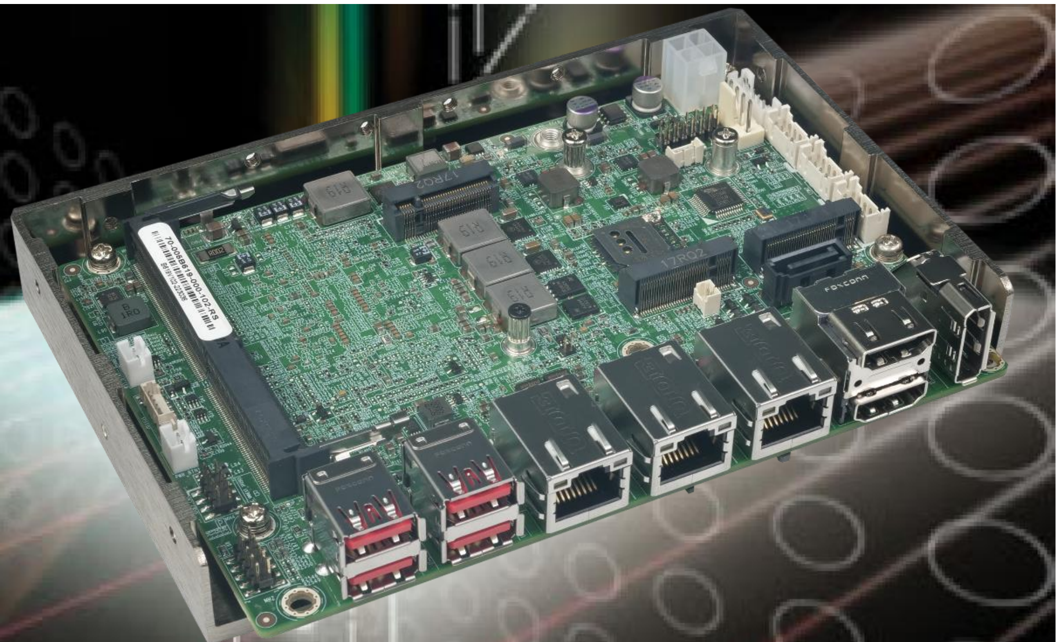
IEI Integration Corp.



MODEL:

WAFER-TGL-U

3.5" SBC Supports Intel® Tiger Lake-UP3 Core™, Celeron® Proccessor, with HDMI, DP, iDPM, Triple 2.5GbE LAN, USB 3.2, M.2, SATA 6Gb/s, COM, Audio, 0°C ~60°C and RoHS

User Manual

Rev. 1.00 - July 11, 2022

RoHS Lead Free

Revision

Date	Version	Changes
July 11, 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-TGL-U

The WAFER-TGL-U series is a 3.5" form factor single bard computer. It has an on-board 11th generation Intel® Core™ i7/i5/i3 or Celeron® processor, and supports one 260-pin 3200 MHz dual-channel DDR4 SDRAM SO-DIMM slot with up to 32.0 GB of memory.

The WAFER-TGL-U series includes two HDMI connectors, a DP connector and an iDPM connector for quadruple independent display.

Expansion and I/O include one M.2 B-key slot supporting 5G module, one M.2 A-key slot for expansions, four 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 one internal RS-232 connector and two internal RS-232/422/485 connectors. Three 2.5GbE RJ-45 connectors provide the system with smooth connections to an external LAN.

1.2 Model Variations

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

Model No.	SoC
WAFER-TGL-U-i7	Intel® Core™ i7-1185G7E on-board SoC (1.8 GHz, quad-core, 12 MB cache, TDP=15 W)
WAFER-TGL-U-i5	Intel® Core™ i5-1145G7E on-board SoC (1.5 GHz, quad-core, 8 MB cache, TDP=15 W)
WAFER-TGL-U-i3	Intel® Core™ i3-1115G4E on-board SoC (2.2 GHz, dual-core, 6 MB cache, TDP=15 W)
WAFER-TGL-U-C	Intel® Celeron® 6305 on-board SoC (1.8 GHz, dual-core, 4 MB cache, TDP=15 W)
WAFER-TGL-U-CE	Intel® Celeron® 6305E on-board SoC (1.8 GHz, dual-core, 4 MB cache, TDP=15 W)

Table 1-1: WAFER-TGL-U Model Variations

1.3 Features

Some of the WAFER-TGL-U motherboard features are listed below:

- 3.5" SBC with 11th generation Intel® ULT processor
- Quadruple independent display via dual HDMI, DP and iDPM
- One 260-pin 3200 MHz dual-channel DDR4 SO-DIMM slot (system max. 32 GB)
- Easy assembly heat spreader for thermal management
- Three RJ-45 Ethernet ports
- One M.2 2230 A-key slot for function expansions
- One M.2 3052/2242 B-key slot with 5G module support
- One SATA 6Gb/s connector with power output
- Four USB 3.2 Gen 2 external connectors
- One RS-232 connector and two RS-232/422/485 connectors

1.4 Connectors

The connectors on the WAFER-TGL-U are shown in the figure below.

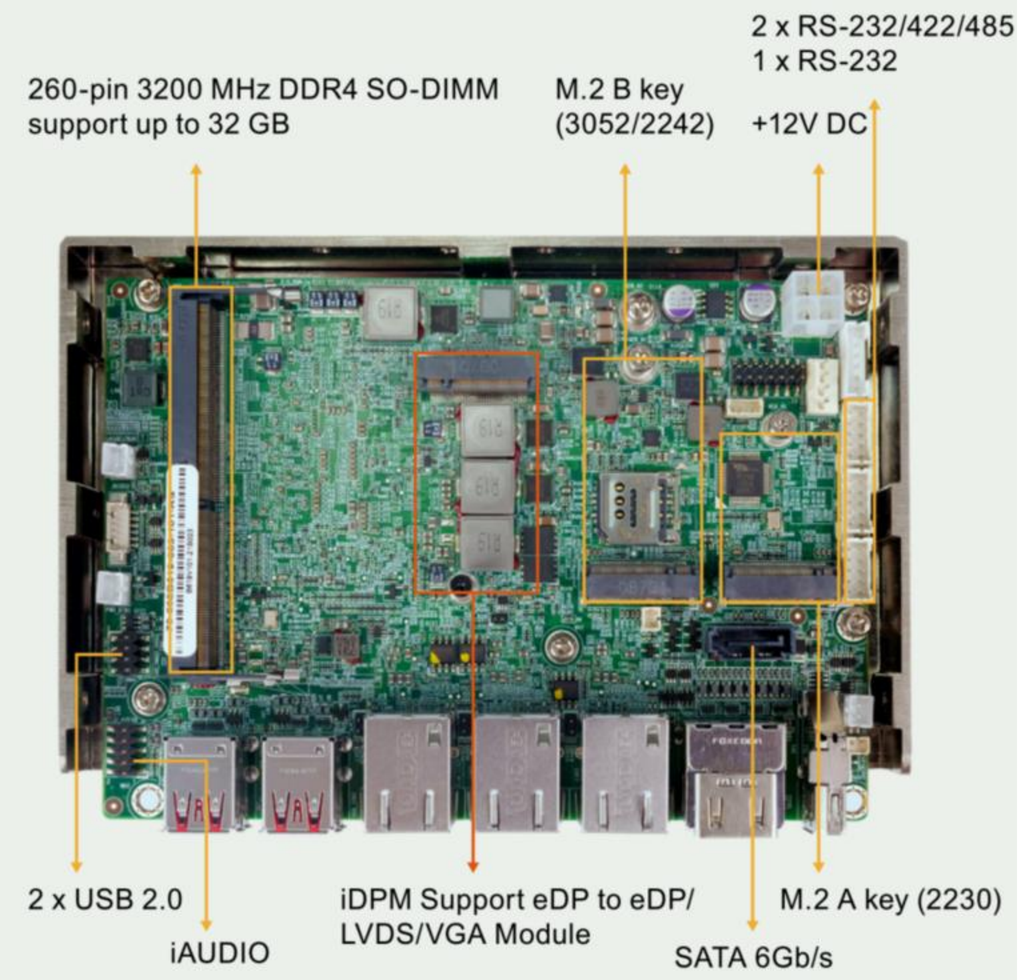


Figure 1-2: Connectors

1.5 Dimensions

The dimensions of the board are listed below:

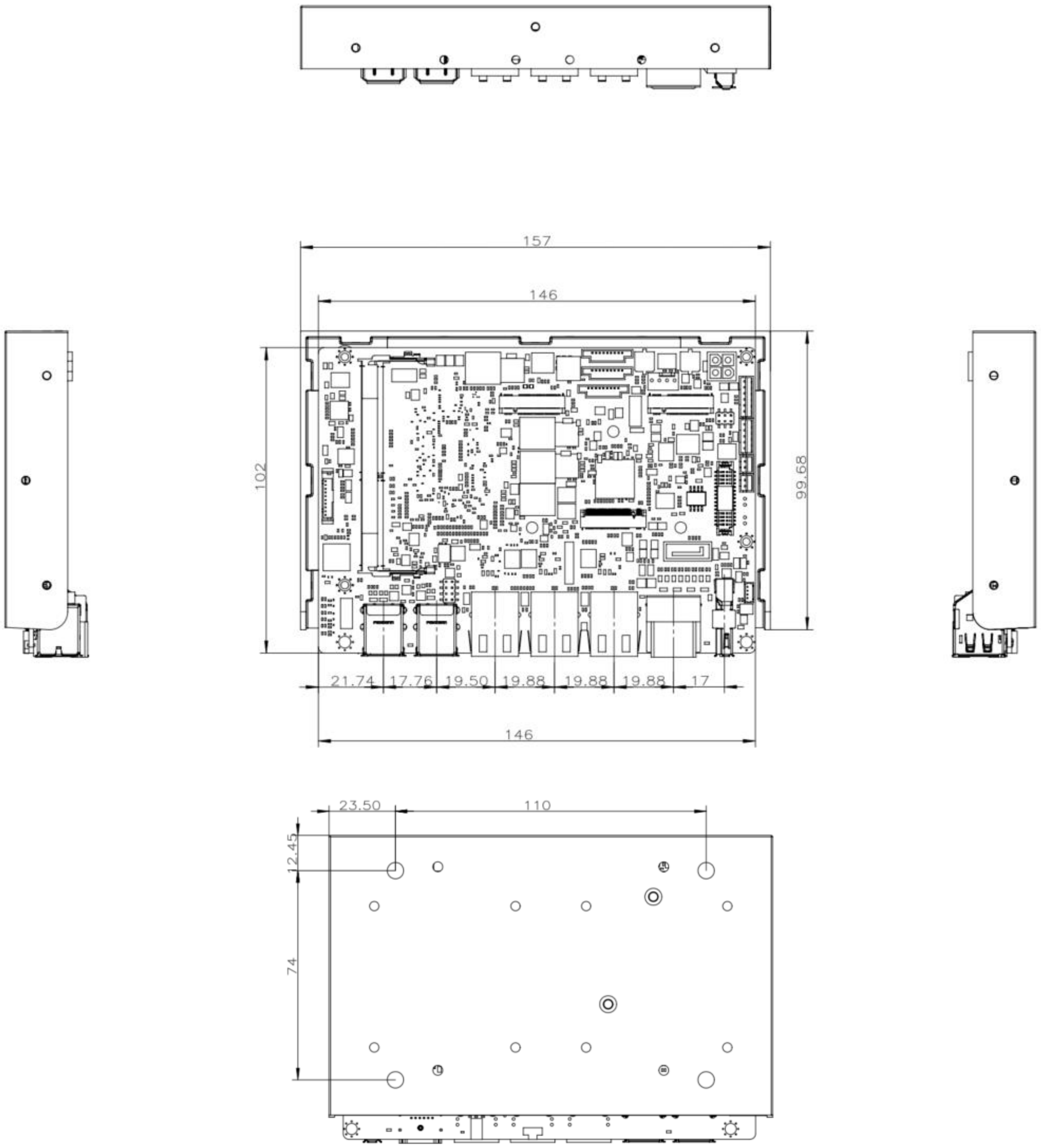


Figure 1-3: Dimensions (mm)

1.6 Data Flow

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

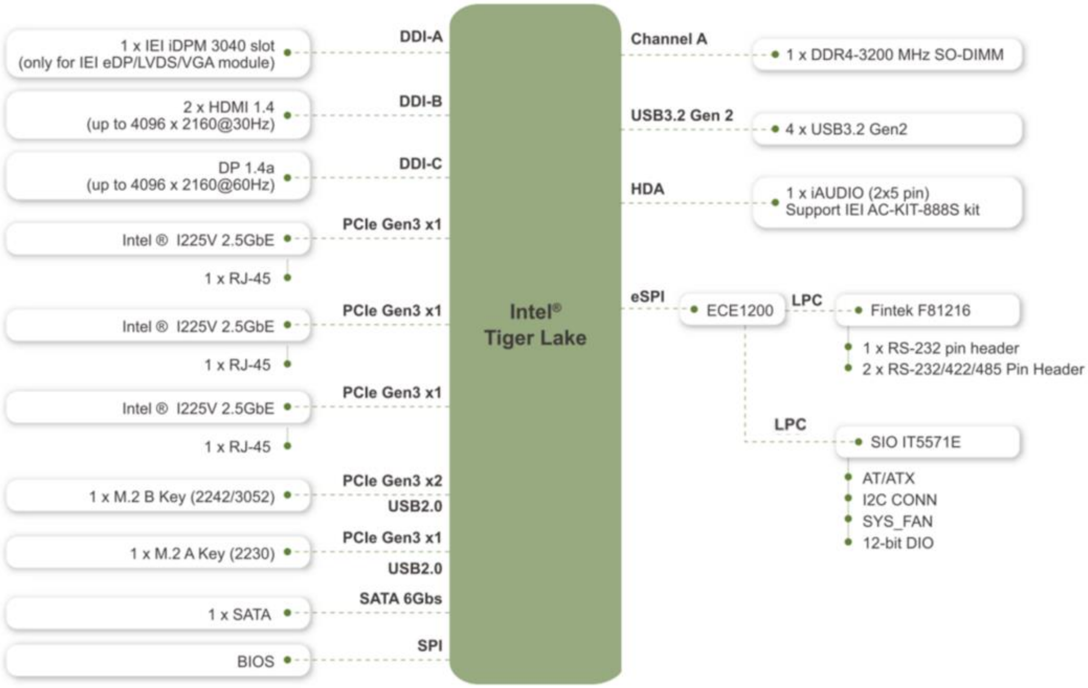


Figure 1-4: Data Flow Diagram

1.7 Technical Specifications

WAFER-TGL-U technical specifications are listed below.

Specification	**WAFER-TGL-U**
SoC	11th generation Intel® mobile ULT on-board SoC: ▪ Intel® Core™ i7-1185G7E on-board SoC (1.8 GHz, quad-core, 12 MB cache, TDP=15 W) ▪ Intel® Core™ i5-1145G7E on-board SoC (1.5 GHz, quad-core, 8 MB cache, TDP=15 W) ▪ Intel® Core™ i3-1115G4E on-board SoC (2.2 GHz, dual-core, 6 MB cache, TDP=15 W) ▪ Intel® Celeron® 6305 on-board SoC (1.8 GHz, dual-core, 4 MB cache, TDP=15 W) ▪ Intel® Celeron® 6305E on-board SoC (1.8 GHz, dual-core, 4 MB cache, TDP=15 W)
BIOS	AMI UEFI BIOS
Memory	One 260-pin 3200 MHz dual-channel DDR4 SO-DIMM slots (system max. 32 GB)
Graphics	Intel® UHD Graphics 620
Display Output	Quadruple independent display 2 x HDMI (up to 4096x2160@30Hz) 1 x DP (up to 4096x2160@60Hz) 1 x IEI iDPM 3040 slot (only for IEI eDP/LVDS/VGA module)
Ethernet	LAN1/LAN2/LAN3: Intel® I225V PCIe 2.5GbE controller (colay with Intel® I225)
Digital I/O	12-bit digital I/O by 10-pin (2x7) header
Super IO	ITE IT5571E-128
Watchdog Timer	Software programmable support 1~255 sec. system reset

I/O Interface	
Audio Connector	1 x iAUDIO (2x5 pin) supporting IEI AC-KIT-888S kit
Ethernet	3 x RJ-45 2.5GbE port
Serial Ports	1 x RS-232 by 10-pin (2x5) header 2 x RS-232/422/485 by 10-pin (2x5) header
USB Ports	4 x USB 3.2 Gen 2 (10Gb/s) on rear I/O 2 x USB 2.0 by 8-pin (2x4) 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 Smart fan connector by 4-pin (1x4) wafer
SMBus/I^{2}C	1 x I^{2}C connector by 4-pin (1x4) wafer
Storage	1 x SATA 6Gb/s with 5 V SATA power connectors
Expansions	1 x M.2 2230 A-key slot (USB 2.0 / PCIe x1) 1 x M.2 3052/2242 B-key slot (PCIe 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@4.0A (11th Gen Intel® Core™ i5-1145G7E 2.6GHz with 8GB 3200MHz DDR4 memory and EUP enabled)
Operating Temperature	0°C ~ 60°C
Storage Temperature	-20°C ~ 70°C
Humidity	5% ~ 95%, non-condensing
Physical Specifications	
Dimensions	146mm x 102mm
Weight GW/NW	850g / 350g

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-TGL-U 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:

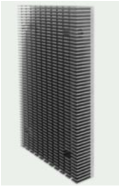
If any of the components listed in the checklist below are missing, do not proceed with the installation. Contact the IEI reseller or vendor the WAFER-TGL-U was purchased from or contact an IEI sales representative directly by sending an email to sales@ieiworld.com.

The WAFER-TGL-U is shipped with the following components:

Quantity	Item and Part Number	Image
1	WAFER-TGL-U single board computer	
1	Power cable	
1	SATA with power cable kit	
1	Quick Installation Guide	 WAFER-TGL Quick Installation Guide Version 1.0 May 24, 2022 Package List WAFER-TGL package includes the following items: 1 x WAFER-TGL single board computer 1 x Power cable 1 x SATA with power cable 1 x QIG ©2022 Copyright by IEI Integration Corp. All rights reserved.

2.4 Optional Items

The following are optional components which may be separately purchased:

Item and Part Number	**Image**
RS-232/422/485 cable, 250 mm, p=1.25 (**P/N** : 32205-002700-200-RS)	
Audio kit, 7.1 Channel (**P/N**: AC-KIT-888S)	
USB cable, 300mm, P=2.00 (**P/N**: CB-USB02A-RS)	
eDP to eDP converter board (for IEI iDPM connector) (**P/N**: iDPM-eDP-R10)	
eDP to LVDS board (for IEI iDPM connector) (**P/N**: iDPM-LVDS-R10)	
Cooler module (with fan) (**P/N**: CM-WAFER-WF-R10)	
Cooler module (without fan) (**P/N**: CM-WAFER-WOF-R10)	

Chapter

3

Connectors

3.1 Peripheral Interface Connectors

This chapter details all the jumpers and connectors.

3.1.1 WAFER-TGL-U Layout

The figures below show all the connectors and jumpers.

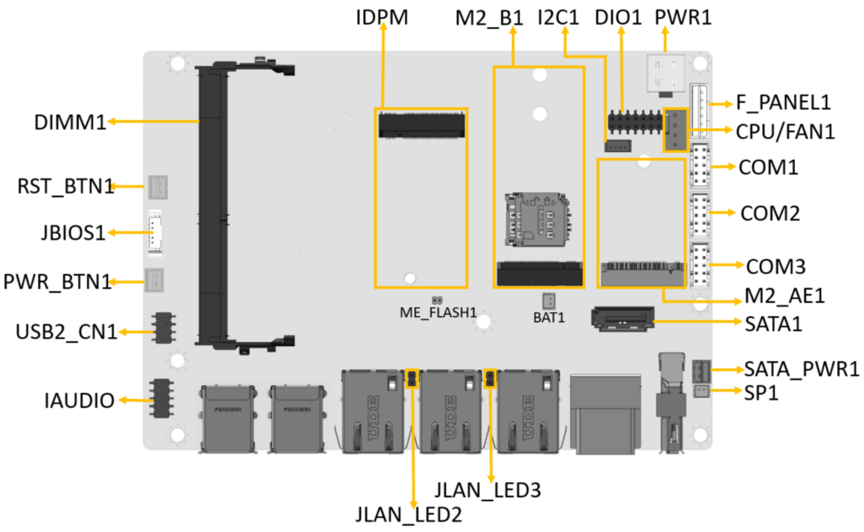


Figure 3-1: Connector and Jumper Locations

3.1.2 Peripheral Interface Connectors

The table below lists all the connectors on the board.

Connector	Type	Label
Audio connector	10-pin header	IAUDIO
Battery connector	2-pin wafer	BAT1
Digital I/O connector	14-pin header	DIO1
Fan connector	4-pin wafer	CPU/FAN1
Front panel connector	6-pin wafer	F_PANEL1
LAN LED connector	2-pin header	JLAN_LED2, JLAN_LED3

iDPM connector	75-pin slot	IDPM
M.2 2230 A-key slot	M.2 A-key slot	M2_AE1
M.2 3052/2042 B-key slot	M.2 B-key slot	M2_B1
Memory module slot	260-pin DDR4 SO-DIMM	DIMM1
Power connector	4-pin Molex	PWR1
Power button connector	2-pin wafer	PWR_BTN1
Reset button connector	2-pin wafer	RST_BTN1
RS-232 serial port connector	10-pin header	COM1
RS-232/422/485 serial port connector	10-pin header	COM2,COM3
Serial ATA connector	7-pin SATA connector	SATA1
SATA power connector	2-pin wafer	SATA_PWR1
SMBus/I^{2}C connector	4-pin wafer	I2C1
USB 2.0 connector	8-pin header	USB2_CN1

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
HDMI connector	HDMI	HDMI1
DP connector	DP	DP1
LAN connectors	RJ-45	LAN1, LAN2, LAN3
USB 3.2 Gen 2 connectors	USB 3.2 Gen 2	USB_CON1, USB_CON2

Table 3-2: Rear Panel Connectors

3.2 Internal Peripheral Connectors

The section describes all of the connectors on the WAFER-TGL-U.

3.2.1 Audio Connector

CN Label:	**IAUDIO1**
CN Type:	10-pin header, p=2.00 mm
CN Location:	See **Figure 3-2**
CN Pinouts:	See **Table 3-3**

The audio connector can be connected with IEI AC-KIT-888S HD audio module to provide audio input and output to and from the system.

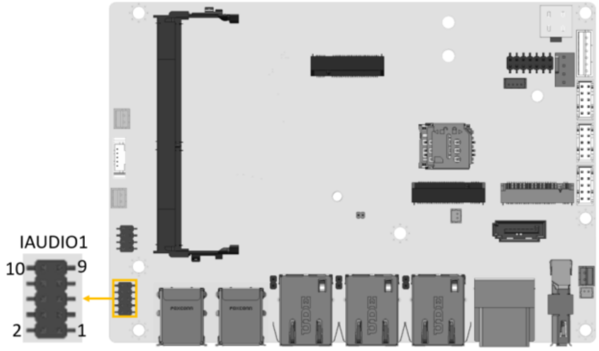


Figure 3-2: Audio Connector Location

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	HDA_SYNC	2	HDA_CLK
3	HDA_SDOUT	4	HDA_SPKR
5	HDA_SDIN	6	HDA_RST#
7	+5V	8	GND
9	+12V	10	GND

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 WAFER-TGL-U 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**

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.

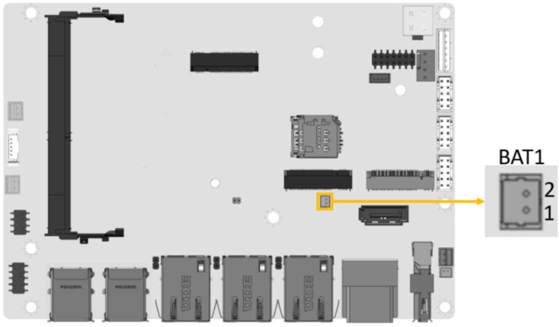


Figure 3-3: Battery Connector Location

Pin	Description
1	VBAT+
2	GND

Table 3-4: Battery Connector Pinouts

3.2.3 Digital I/O Connector

CN Label:	**DIO1**
CN Type:	14-pin header, p=2.00 mm
CN Location:	See **Figure 3-4**
CN Pinouts:	See **Table 3-5**

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

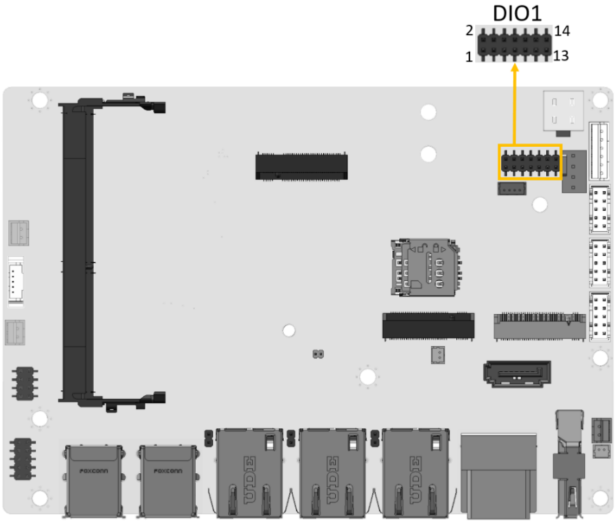


Figure 3-4: Digital I/O Connector Location

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GND	2	VCC
3	DOUT5	4	DOUT4

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
5	DOUT3	6	DOUT2
7	DOUT1	8	DOUT0
9	DIN5	10	DIN4
11	DIN3	12	DIN2
13	DIN1	14	DIN0

Table 3-5: Digital I/O Connector Pinouts

3.2.4 Fan Connector

CN Label:	**CPU/FAN1**
CN Type:	4-pin wafer, p=2.54 mm
CN Location:	See **Figure 3-5**
CN Pinouts:	See **Table 3-6**

The fan connector attaches to a smart cooling fan.

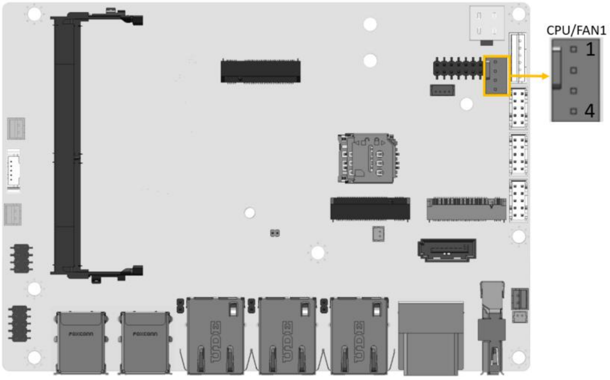


Figure 3-5: Fan Connector Location

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

Table 3-6: Fan Connector Pinouts

3.2.5 Front Panel Connector

CN Label: **F_PANEL1**

CN Type: 6-pin wafer, p=2.00 mm

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

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

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

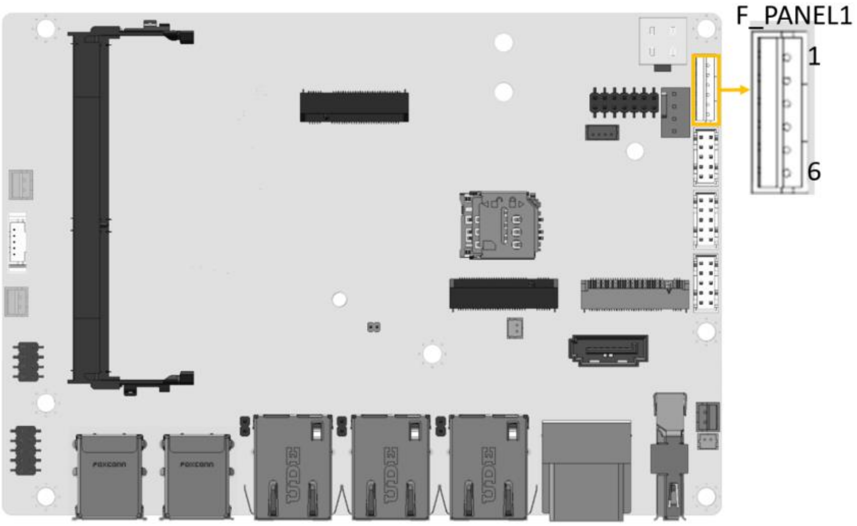


Figure 3-6: Front Panel Connector Location

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

Table 3-7: Front Panel Connector Pinouts

3.2.6 LAN LED Connectors

CN Label: **JLAN_LED2, JLAN_LED3**

CN Type: 2-pin header, p=2.00 mm

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

CN Pinouts: See **Table 3-8**

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

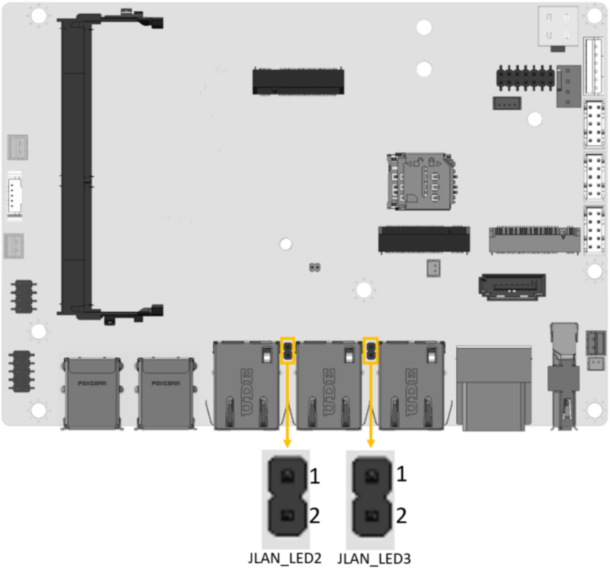


Figure 3-7: LAN LED Connector Locations

Pin	Description
1	+3.3V
2	LAN1_LED_LNK#_ACT

Table 3-8: LAN LED Connector Pinouts

3.2.7 iDPM Connector

CN Label:	**IDPM**
CN Type:	75-pin slot, p=0.5 mm
CN Location:	See **Figure 3-8**
CN Pinouts:	See **Table 3-9**

The iDPM slot only use for IEI eDP/LVDS/VGA module

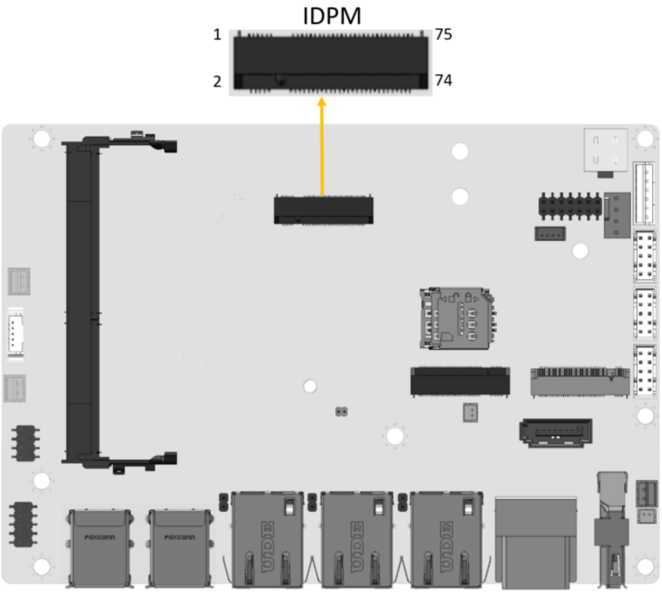


Figure 3-8: iDPM Connector Location

Pin	Description	Pin	Description
1	GND	2	+3.3V
3	GND	4	+3.3V
5	GND	6	+3.3V
7	GND	8	+3.3V
9	GND	10	+3.3V
11	+5V	12	Module Key
13	Module Key	14	Module Key
15	Module Key	16	Module Key
17	Module Key	18	Module Key

Pin	Description	Pin	Description
19	Module Key	20	+3.3VS
21	DISPLAY_DETECT_PIN21	22	+3.3VS
23	DISPLAY_DETECT_PIN23	24	+3.3VS
25	GND	26	+3.3VS
27	GND	28	GND
29	EDP_TX3_DN	30	+12VS
31	EDP_TX3_DP	32	+12VS
33	GND	34	+12VS
35	EDP_TX2_DN	36	+12VS
37	EDP_TX2_DP	38	GND
39	GND	40	SMB_CLK
41	EDP_TX1_DN	42	SMB_DATA
43	EDP_TX1_DP	44	GND
45	GND	46	EC_BKLT_CTRL
47	EDP_TX0_DN	48	EDP1_BKLT_CTRL
49	EDP_TX0_DP	50	EDP1_BKLT_EN
51	GND	52	EDP1_VDD_EN #
53	EDP_AUX_DN	54	EDP_HPD_R
55	EDP_AUX_DP	56	BUF_PLT_RST#
57	GND	58	LVDS_EN
59	GND	60	+V5S
61	GND	62	+V5S
63	GND	64	+V5S
65	GND	66	+V5S
67	GND	68	+12VA
69	GND	70	+12VA
71	GND	72	+12VA
73	GND	74	+12VA
75	GND		

Table 3-9: iDPM Connector Pinouts

3.2.8 M.2 Slot, B-key

CN Label:	**M2_B1**
CN Type:	M.2 B-key slot
CN Location:	See **Figure 3-9**
CN Pinouts:	See **Table 3-10**

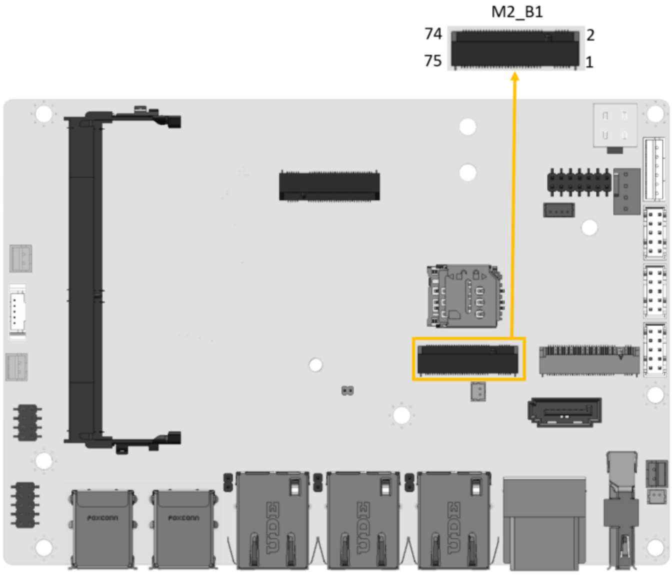


Figure 3-9: M.2 B-key Slot Location

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

Pin	Description	Pin	Description
1	CONFIG_3	2	+3.3V
3	GND	4	+3.3V
5	GND	6	WWAN_FCP_OFF
7	USB_D+	8	WWAN_DISABLE
9	USB_D-	10	NC
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	NC
21	CONFIG_0	22	NC
23	NC	24	NC
25	NC	26	NC
27	GND	28	NC
29	PCIE_RXN5	30	WWAN_UIM_RST
31	PCIE_RXP5	32	WWAN_UIM_CLK
33	GND	34	WWAN_UIM_DATA
35	PCIE_TXN5	36	UIM_PWR
37	PCIE_TXP5	38	DEVSLP
39	GND	40	NC
41	PCIE_RXN4	42	NC
43	PCIE_RXP4	44	NC
45	GND	46	NC
47	PCIE_TXN4	48	NC
49	PCIE_TXP4	50	BUF_PLT_RST#
51	GND	52	N/C
53	REFCLKN	54	PCIE_WAKE#
55	REFCLKP	56	NC
57	GND	58	NC
59	NC	60	NC
61	NC	62	NC
63	NC	64	NC
65	NC	66	NC
67	WWAN_RST	68	NC
69	GND	70	+3.3V
71	GND	72	+3.3V
73	GND	74	+3.3V
75	GND		

Table 3-10: M.2 B-Key Slot Pinouts

3.2.9 M.2 Slot, A-key

CN Label:	**M2_A1**
CN Type:	M.2 A-key slot
CN Location:	See **Figure 3-10**
CN Pinouts:	See **Table 3-11**

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.

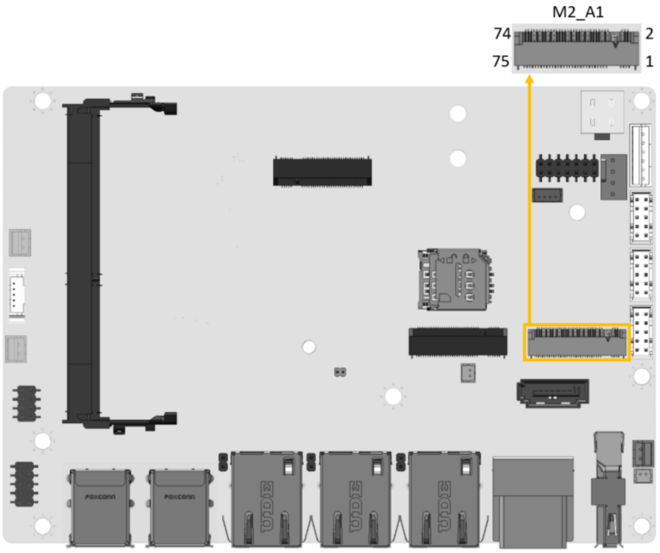


Figure 3-10: M.2 A-key Slot Location

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

Pin	Description	Pin	Description
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_TX9+	36	GND
37	PCIE_TX9-	38	CL_RST#
39	GND	40	CL_DATA
41	PCIE_RX9+	42	CL_CLK
43	PCIE_RX9-	44	NC
45	GND	46	NC
47	CLK_M2_A+	48	NC
49	CLK_M2_A-	50	NC
51	GND	52	BUF_PLT_RST#
53	NC	54	Pull Up +V3.3A
55	NC	56	Pull Up +V3.3A
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	+V3.3A
73	NC	74	+V3.3A
75	GND		

Table 3-11: M.2 A-Key Slot Pinouts

3.2.10 DDR4 SO-DIMM Socket

CN Label:	**DIMM1**
CN Type:	260-pin DDR4 SO-DIMM socket
CN Location:	See **Figure 3-11**

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

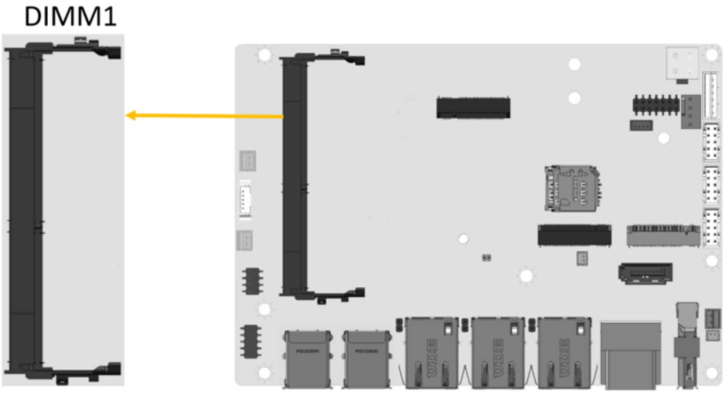


Figure 3-11: DDR4 SO-DIMM Socket Location

3.2.11 Power Connector

CN Label:	**PWR1**
CN Type:	4-pin Molex, p=4.2 mm
CN Location:	See **Figure 3-12**
CN Pinouts:	See **Table 3-12**

The connector supports the +12V power supply.

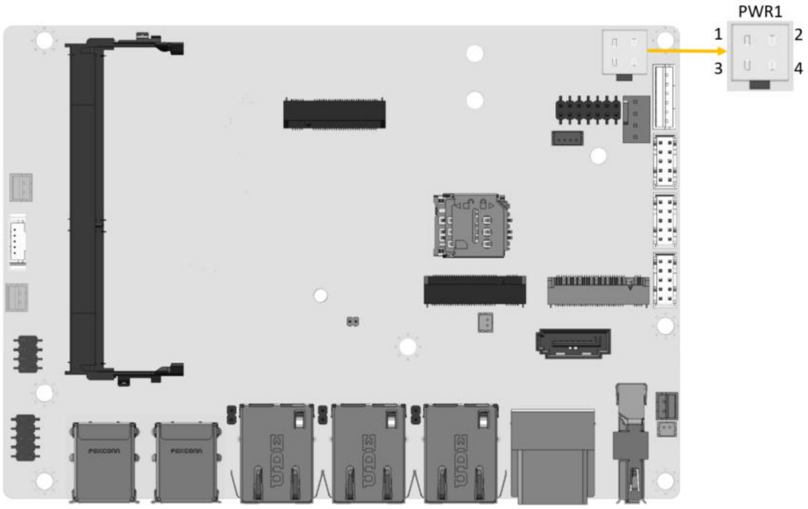


Figure 3-12: +12V DC-IN Power Connector Location

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

Table 3-12: +12V DC-IN Power Connector Pinouts

3.2.12 Power Button Connector

CN Label: **PWR_BTN1**

CN Type: 2-pin wafer, p=2.00 mm

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

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

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

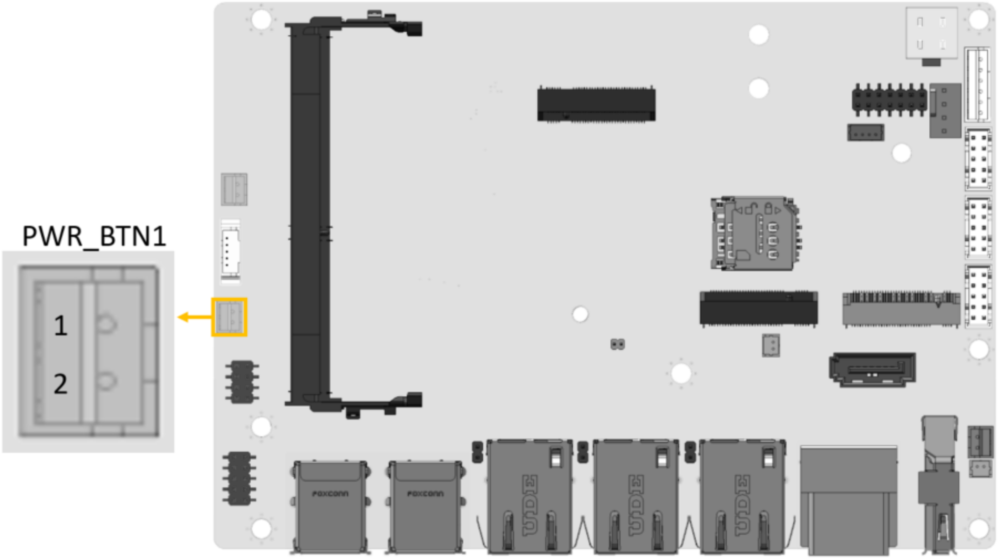


Figure 3-13: Power Button Connector Location

Pin	**Description**
1	PWR_BTN+
2	PWR_BTN-

Table 3-13: Power Button Connector Pinouts

3.2.13 Reset Button Connector

CN Label: **RST_BTN1**

CN Type: 2-pin wafer, p=2.00 mm

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

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

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.

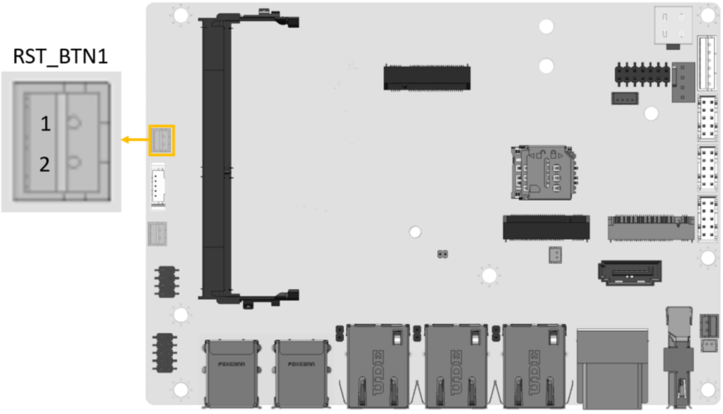


Figure 3-14: Reset Button Connector Location

Pin	Description
1	RESET+
2	RESET-

Table 3-14: Reset Button Connector Pinouts

3.2.14 RS-232 Serial Port Connector

CN Label: **COM1**

CN Type: 10-pin header, p=2.0 mm

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

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

The serial connector provides RS-232 connection.

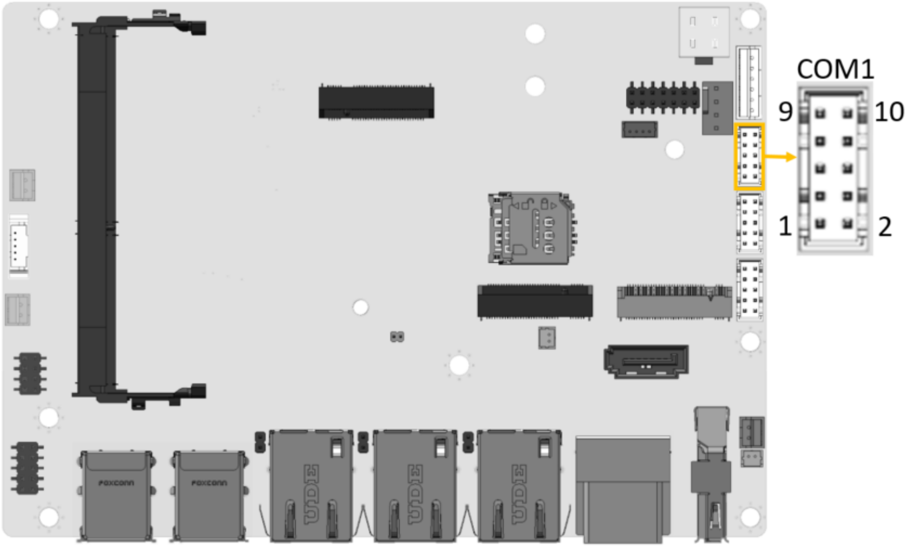


Figure 3-15: RS-232 Serial Port Connector Location

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	DCD	2	DSR
3	RXD	4	RTS
5	TXD	6	CTS
7	DTR	8	RI
9	GND	10	GND

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

3.2.15 RS-232/422/485 Serial Port Connector

CN Label:	**COM2, COM3**
CN Type:	10-pin header, p=2.0 mm
CN Location:	See **Figure 3-16**
CN Pinouts:	See **Table 3-16**

This connector provides RS-232, RS-422 or RS-485 communications. The default mode is set to RS-232. Use BIOS to configure the connectors as RS-422 or RS-485.

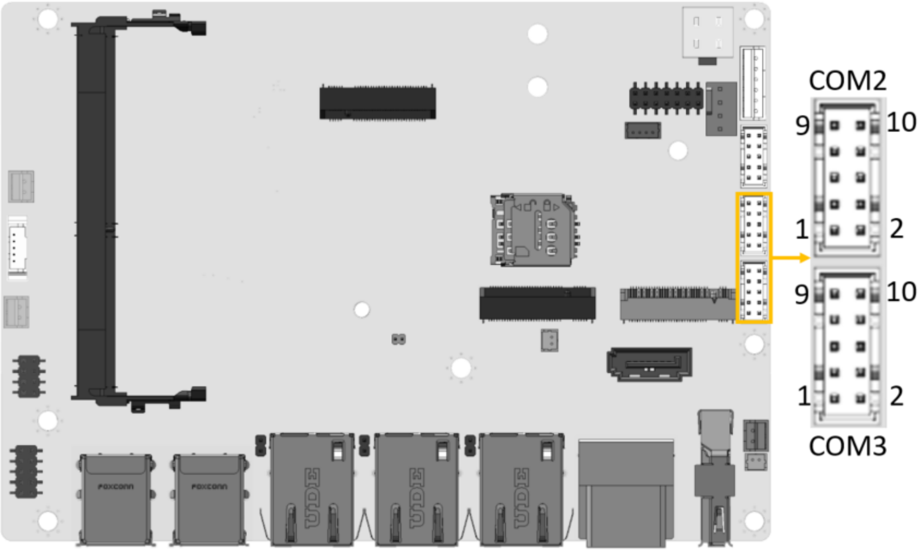


Figure 3-16: RS-232/422/485 Connector Location

Pin	**RS-232**	**RS-422**	**RS-485**
1	DCD	TXD-	DATA-
2	DSR	N/A	N/A
3	RXD	TXD+	DATA+
4	RTS	N/A	N/A
5	TXD	RXD+	N/A
6	CTS	N/A	N/A
7	DTR	RXD-	N/A
8	RI	N/A	N/A
9	GND	N/A	N/A

Pin	RS-232	RS-422	RS-485
10	GND		

Table 3-16: RS-232/422/485 Serial Port Connector Pinouts

Use the optional RS-232/422/485 cable to connect to a serial device. The pinouts of the DB-9 connector are listed below.

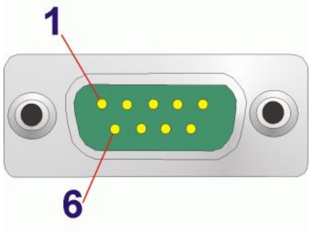
Pin	RS-232	RS-422	RS-485	
1	DCD	TXD422-	TXD485-	
2	RXD	TXD422+	TXD485+	
3	TXD	RXD422+	--	
4	DTR	RXD422-	--	
5	GND	--	--	
6	DSR	--	--	
7	RTS	--	--	
8	CTS	--	--	
9	RI	--	--	

Table 3-17: DB-9 RS-232/422/485 Pinouts

3.2.16 SATA 6Gb/s Drive Connector

CN Label:	**SATA1**
CN Type:	7-pin SATA connector
CN Location:	See **Figure 3-17**

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.

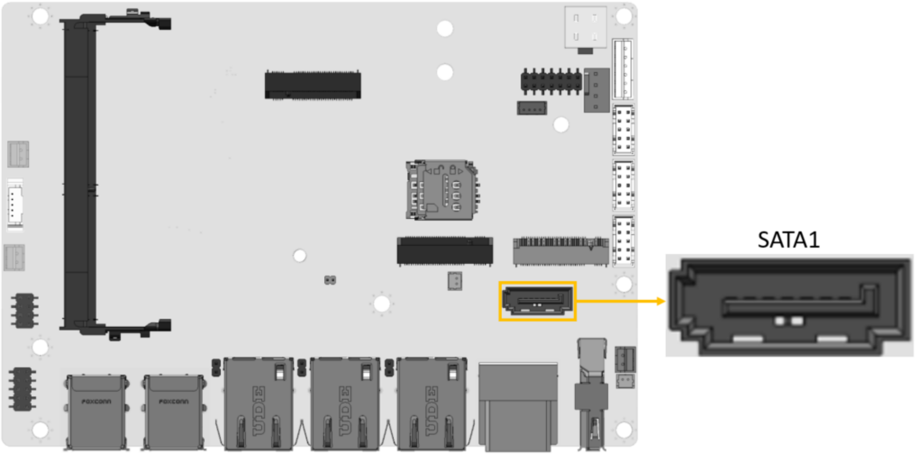


Figure 3-17: SATA 6Gb/s Drive Connectors Location

3.2.17 SATA Power Connector

CN Label:	**SATA_PWR1**
CN Type:	2-pin wafer, p=2.00 mm
CN Location:	See **Figure 3-18**
CN Pinouts:	See **Table 3-18**

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

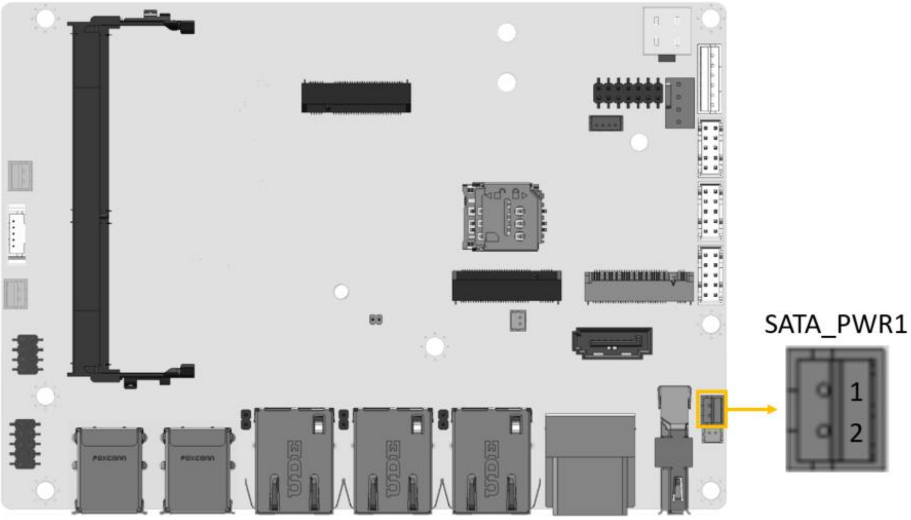


Figure 3-18: SATA Power Connector Location

Pin	Description
1	+5V
2	GND

Table 3-18: SATA Power Connector Pinouts

3.2.18 SMBus/I^{2}C Connector

CN Label: **I2C1**

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

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

CN Pinouts: See **Table 3-19**

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

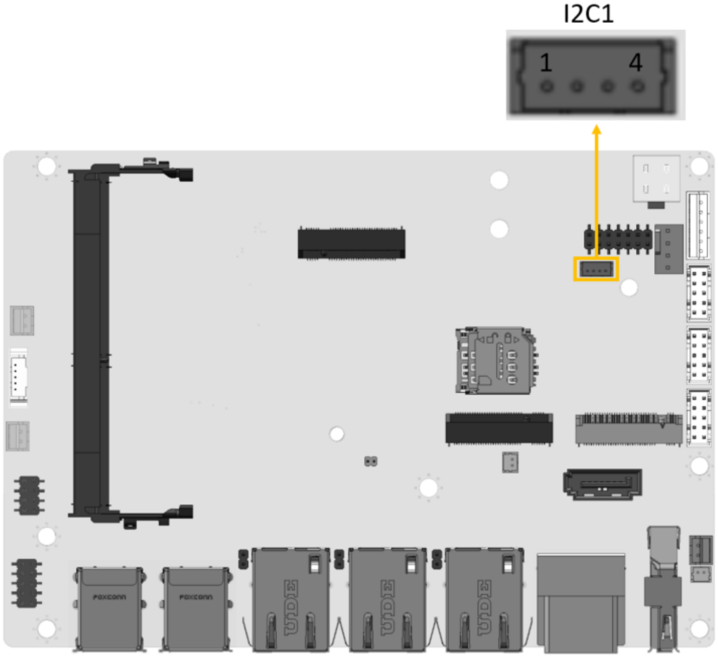


Figure 3-19: SMBus Connector Location

Pin	**Description**
1	GND
2	SMBus_DATA
3	SMBus_CLK
4	+5V

Table 3-19: SMBus Connector Pinouts

3.2.19 USB 2.0 Connector

CN Label:	**USB2_CN1**
CN Type:	8-pin header, p=2.00 mm
CN Location:	See **Figure 3-20**
CN Pinouts:	See **Table 3-20**

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

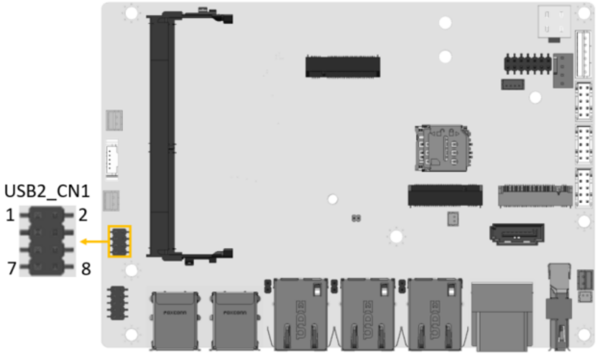


Figure 3-20: USB Connector Location

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

Table 3-20: USB Connector Pinouts

3.3 External Peripheral Interface Connector Panel

Figure 3-21 shows the WAFER-TGL-U external peripheral interface connector (EPIC) panel. The EPIC panel consists of the following:

- 2 x HDMI connector
- 1 x DP connector
- 3 x 2.5GbE RJ-45 connector
- 4 x USB 3.2 Gen 2 connector

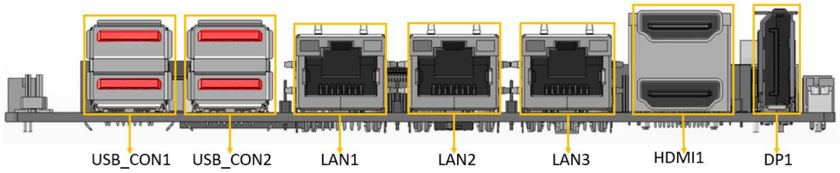


Figure 3-21: External Peripheral Interface Connector

3.3.1 HDMI Connectors

CN Label:	**HDMI1**
CN Type:	HDMI connector
CN Location:	See **Figure 3-21**
CN Pinouts:	See **Table 3-21** and **Figure 3-22**

The HDMI connectors can connect to HDMI devices.

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 3-21: HDMI Connector Pinouts

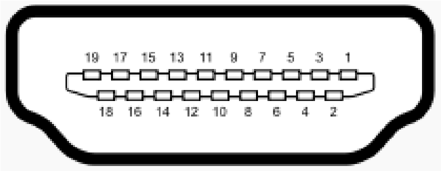


Figure 3-22: HDMI Connector Pinout Locations

3.3.2 DP Connector

CN Label:	**DP1**
CN Type:	DP connector
CN Location:	See **Figure 3-21**
CN Pinouts:	See **Table 3-22** and **Figure 3-23**

The DP connectors can connect to DP devices.

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 3-22: DP Connector Pinouts

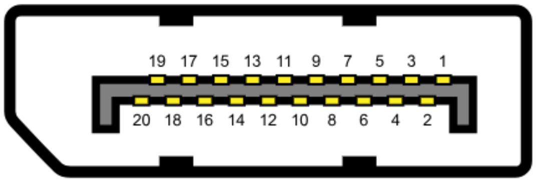


Figure 3-23: DP Connector Pinout Locations

3.3.3 LAN Connectors

CN Label:	**LAN1, LAN2, LAN3**
CN Type:	RJ-45
CN Location:	See **Figure 3-21**
CN Pinouts:	See **Figure 3-24** and **Table 3-23**

The LAN connector connects to a local network.

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

Table 3-23: LAN Pinouts

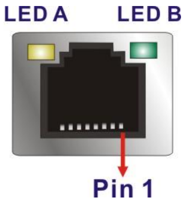


Figure 3-24: LAN Connector

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

Table 3-24: LAN Connector LEDs

3.3.4 USB 3.2 Gen 2 Connectors

CN Label: **USB_CON1, USB_CON2**

CN Type: USB 3.2 Gen 2 port

CN Location: See **Figure 3-21**

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

The WAFER-TGL-U 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.

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 3-25: USB 3.2 Gen 2 Port Pinouts

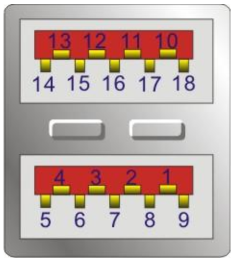


Figure 3-25: USB 3.2 Gen 2 Port Pinouts

Chapter

4

Installation

4.1 Anti-static Precautions

WARNING:

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

Electrostatic discharge (ESD) can cause serious damage to electronic components, including the WAFER-TGL-U. Dry climates are especially susceptible to ESD. It is therefore critical that whenever the WAFER-TGL-U 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-TGL-U, place it on an anti-static pad. This reduces the possibility of ESD damaging the WAFER-TGL-U.
- ***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-TGL-U, WAFER-TGL-U 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-TGL-U 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-TGL-U 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-TGL-U off:
    - ○ When working with the WAFER-TGL-U, 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-TGL-U **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 SO-DIMM Installation

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

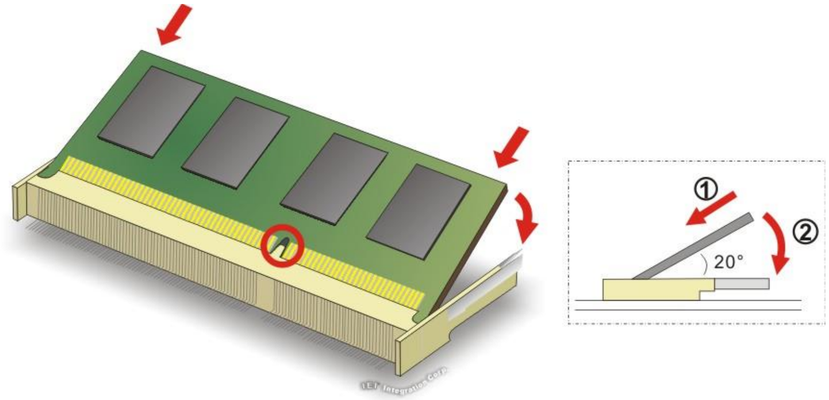


Figure 4-1: SO-DIMM Installation

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 20º angle. (See **Figure 4-1**)

Step 4: **Seat the SO-DIMM**. Gently push downwards and the arms clip into place. (See **Figure 4-1**)

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 20º (**Figure 4-2**).

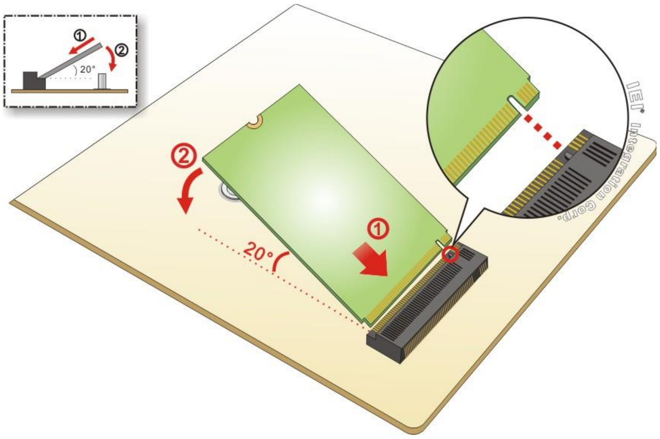


Figure 4-2: Inserting the M.2 Module into the Slot at an Angle

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

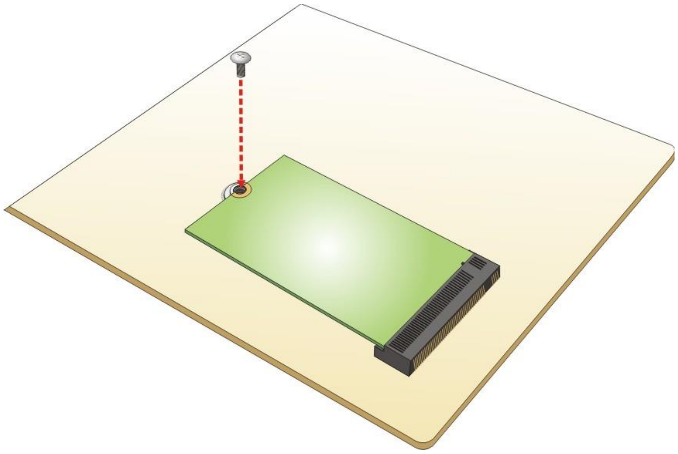


Figure 4-3: Securing the M.2 Module

4.5 System Configuration

The system configuration is controlled by buttons, jumpers and switches. The system configuration should be performed before installation.

4.5.1 AT/ATX Mode Select Switch

The AT/ATX mode select switch specifies the systems power mode as AT or ATX. AT/ATX mode select switch settings are shown in **Figure 4-4** below.

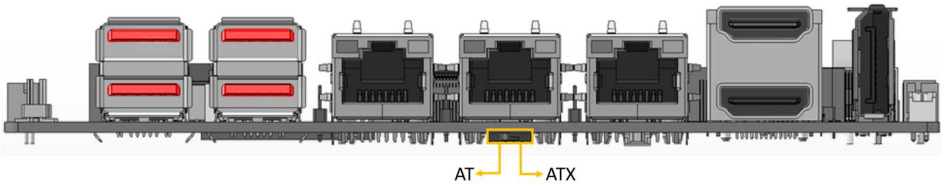


Figure 4-4: AT/ATX Mode Select Switch

4.5.2 Clear CMOS Button

CN Label:	**J_CMOS1**
CN Type:	Button
CN Location:	See **Figure 4-5**

If the WAFER-TGL-U fails to boot due to improper BIOS settings, use the button to clear the CMOS data and reset the system BIOS information.

The location of the clear CMOS button is shown in **Figure 4-5**

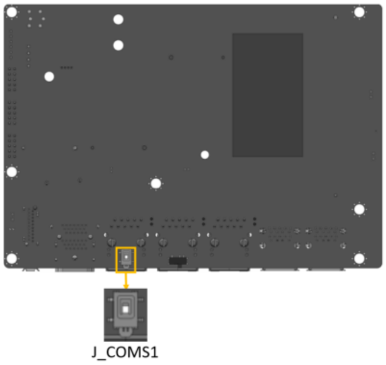


Figure 4-5: Clear CMOS Button Location

4.5.3 Flash Descriptor Security Override Jumper

CN Label:	**ME_FLASH1**
CN Type:	2-pin header, p=1.27 mm
CN Location:	See **Figure 4-6**
CN Settings:	See **Table 4-1**

The Flash Descriptor Security Override jumper (ME_FLASH1) allows to enable or disable the ME firmware update. Refer to **Figure 4-6** and **Table 4-1** for the jumper location and settings.

Setting	Description
Open	Disabled (Default)
Short	Enabled

Table 4-1: Flash Descriptor Security Override Jumper Settings

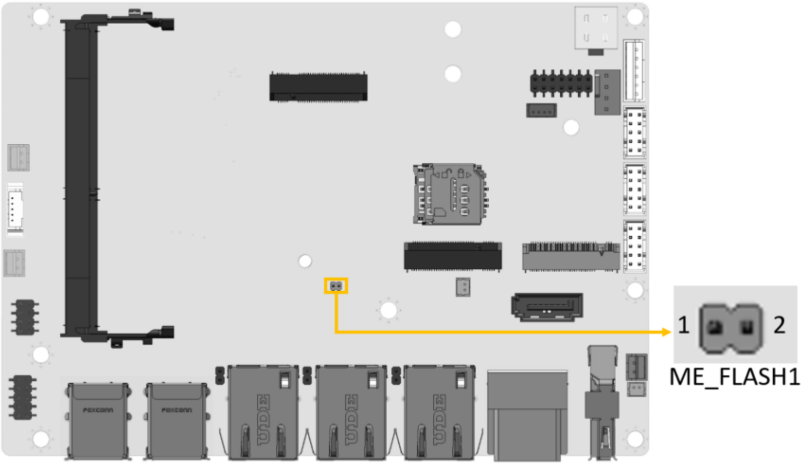


Figure 4-6: Flash Descriptor Security Override Jumper Location

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

Step 1: Before turning on the system power, short 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.

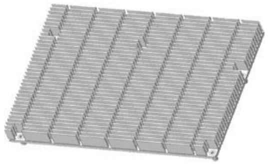
4.6 Chassis Installation

4.6.1 Heat Spreader

WARNING:

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

When the WAFER-TGL-U 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. The following diagrams show an example of a heat sink module and how it can be installed for dissipating the heat generated from the motherboard:



Heat sink module:

Material: Aluminum

Size: 146 mm x 102 mm x 14.6 mm

If the WAFER-TGL-U must be removed from the heat spreader, the four retention screws must be removed.

Figure 4-7: Heat Sink Retention Screws

4.6.2 Motherboard Installation Example

Each side of the heat spreader has several screw holes allowing the WAFER-TGL-U 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-TGL-U. The following diagram shows an example of motherboard installation.

Figure 4-8: Motherboard Installation Example

4.7 Internal Peripheral Device Connections

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

4.7.1 AT Power Connection

Follow the instructions below to connect the WAFER-TGL-U 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-TGL-U.

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 4-9.

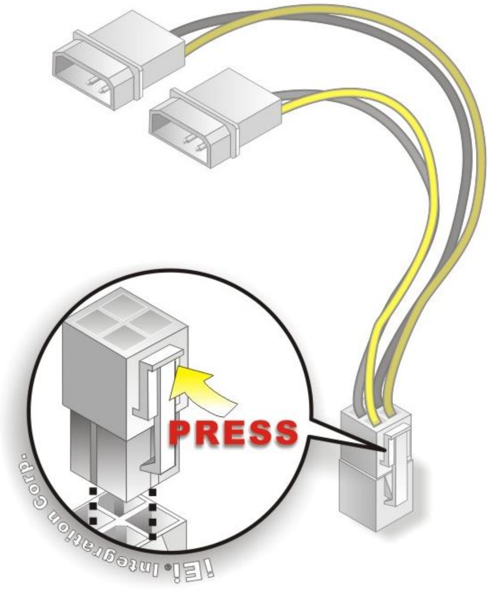


Figure 4-9: Power Cable to Motherboard Connection

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 4-10.

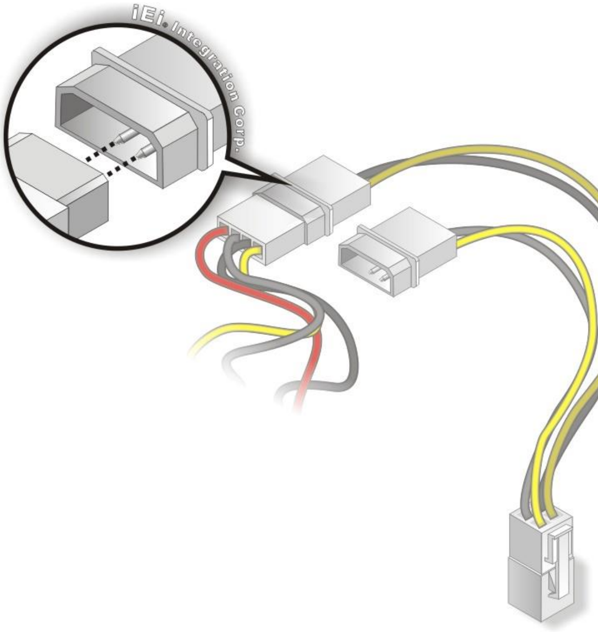


Figure 4-10: Connect Power Cable to Power Supply

4.7.2 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: **Conect the cable to the board**. Connect the other end of the cable to the board. Make sure to line up the marked pin 1.

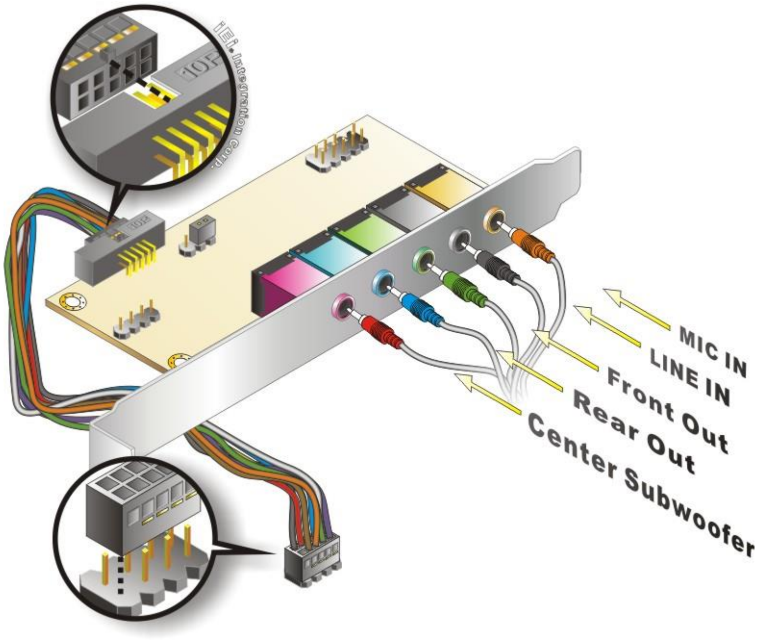


Figure 4-11: 7.1 Channel Audio Kit

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.

4.7.3 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**.

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 4-12**.

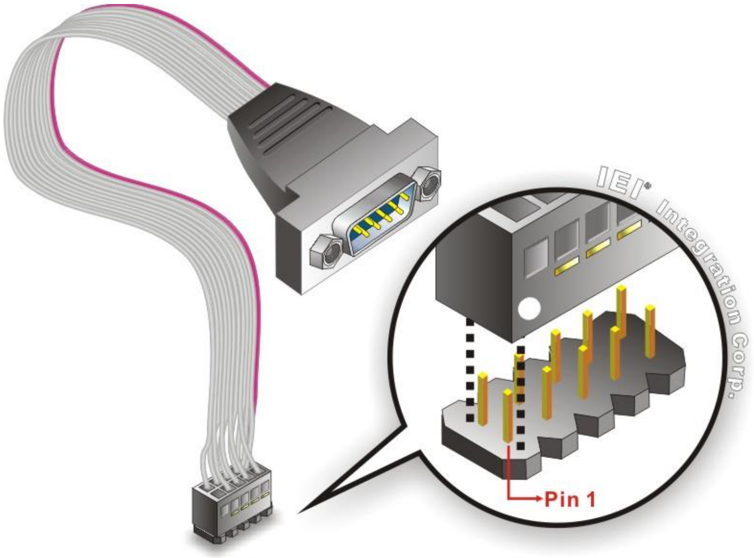


Figure 4-12: Single RS-232 Cable Installation

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.

4.7.4 SATA Drive Connection

The WAFER-TGL-U 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 4-13**.

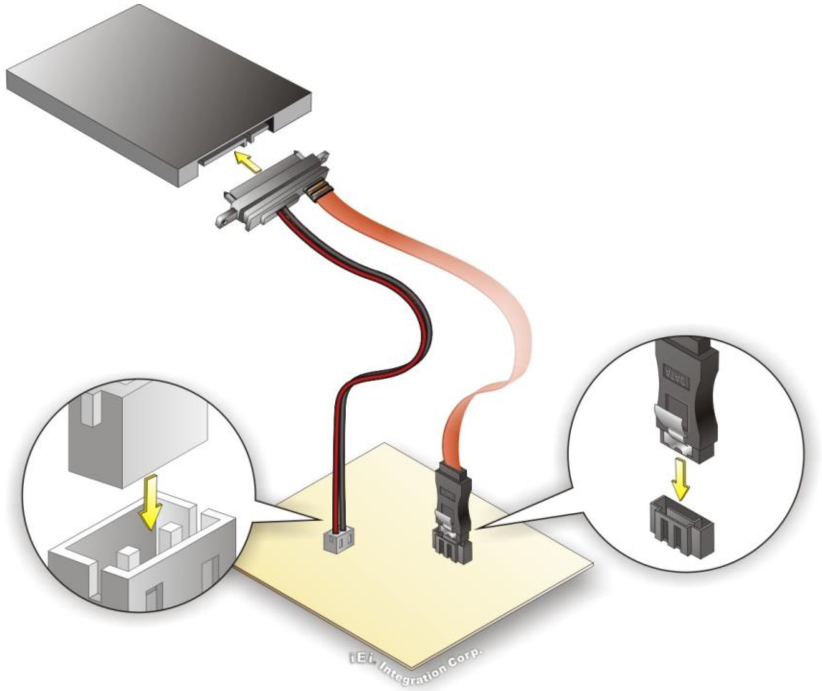


Figure 4-13: SATA Drive Cable Connection

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 4-13**.

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

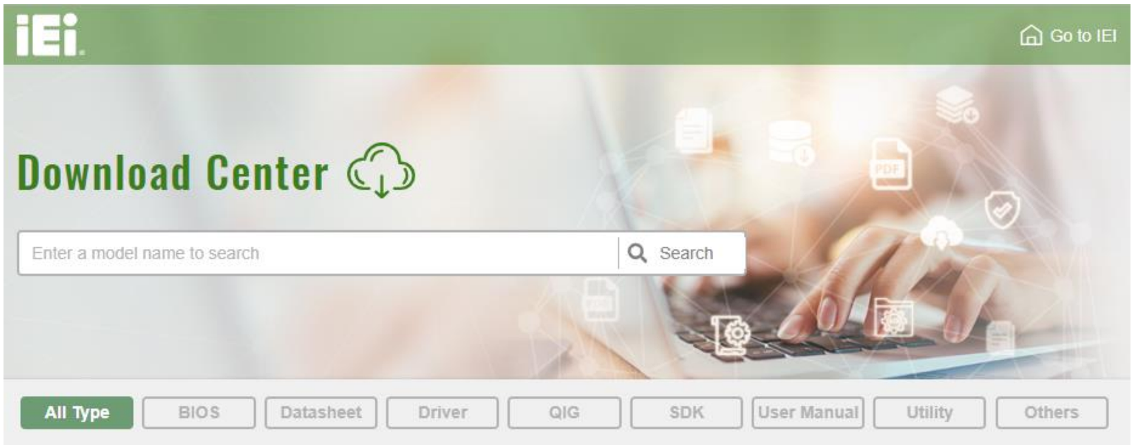
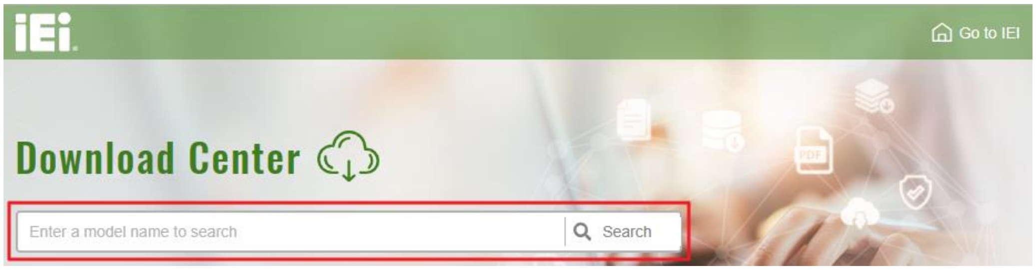


Figure 5-1: IEI Resource Download Center

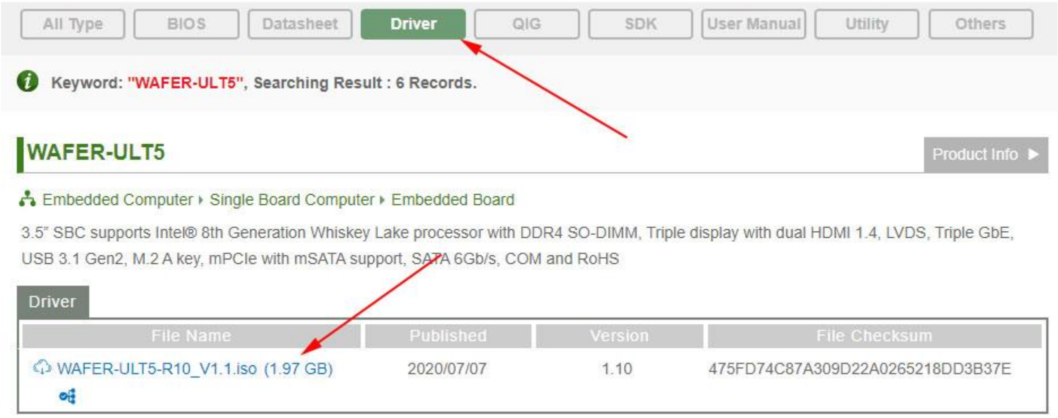
5.2 Driver Download

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

Step 1: Go to https://download.ieiworld.com. Type WAFER-TGL-U and press Enter.



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



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

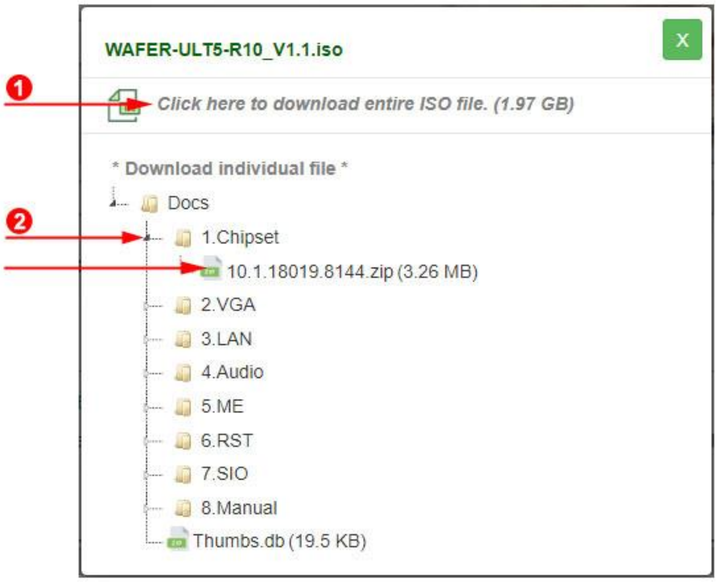
WAFER-ULT5

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

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

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

* Download individual file *

- 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

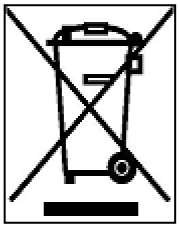
Product Disposal

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

Digital I/O Interface

The DIO connector on the WAFER-TGL-U is interfaced to GPIO ports on the Super I/O chipset. The digital inputs and digital outputs are generally control signals that control the on/off circuit of external devices or TTL devices. Data can be read or written to the selected address to enable the DIO functions.

NOTE:

For further information, please refer to the datasheet for the Super I/O chipset.

The BIOS interrupt call **INT 15H** controls the digital I/O.

INT 15H:

AH – 6FH
Sub-function: **AL – 8** :Set the digital port as INPUT **AL** :Digital I/O input value

Assembly Language Sample 1

```
MOV     AX, 6F08H       ;setting the digital port as input
INT     15H             ;
```

AL low byte = value

AH – 6FH
Sub-function: **AL – 9** :Set the digital port as OUTPUT **BL** :Digital I/O output value

Assembly Language Sample 2

```
MOV      AX, 6F09H      ;setting the digital port as output
MOV      BL, 09H                  ;digital value is 09H
INT      15H                 ;
```

Digital Output is 1001b

Appendix

D

Watchdog Timer

NOTE:

The following discussion applies to DOS. Contact IEI support or visit the IEI website for drivers for other operating systems.

The Watchdog Timer is a hardware-based timer that attempts to restart the system when it stops working. The system may stop working because of external EMI or software bugs. The Watchdog Timer ensures that standalone systems like ATMs will automatically attempt to restart in the case of system problems.

A BIOS function call (INT 15H) is used to control the Watchdog Timer.

INT 15H:

AH – 6FH Sub-function:	
AL – 2:	Sets the Watchdog Timer's period.
BL:	Time-out value (Its unit-second is dependent on the item "Watchdog Timer unit select" in CMOS setup).

Table D-1: AH-6FH Sub-function

Call sub-function 2 to set the time-out period of Watchdog Timer first. If the time-out value is not zero, the Watchdog Timer starts counting down. When the timer value reaches zero, the system resets. To ensure that this reset condition does not occur, calling sub-function 2 must periodically refresh the Watchdog Timer. However, the watchdog timer is disabled if the time-out value is set to zero.

A tolerance of at least 10% must be maintained to avoid unknown routines within the operating system (DOS), such as disk I/O that can be very time-consuming.

NOTE:

The Watchdog Timer is activated through software. The software application that activates the Watchdog Timer must also deactivate it when closed. If the Watchdog Timer is not deactivated, the system will automatically restart after the Timer has finished its countdown.

EXAMPLE PROGRAM:

```
; INITIAL TIMER PERIOD COUNTER

;
W_LOOP:
;

        MOV             AX, 6F02H               ;setting the time-out value
        MOV             BL, 30                  ;time-out value is 48 seconds
        INT       15H

;
; ADD THE APPLICATION PROGRAM HERE
;

        CMP             EXIT_AP, 1              ;is the application over?
        JNE       W_LOOP                  ;No, restart the application

        MOV             AX, 6F02H               ;disable Watchdog Timer
        MOV             BL, 0             ;
        INT       15H

;
; EXIT ;
```

Appendix

E

Error Beep Code

E.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

E.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

F

Hazardous Materials Disclosure

F.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.

F.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。