

3.5" SBC supports 14nm 8th Gen. Intel® Core™ i7/i5/i3 or Celeron® on-board Processor (ULT, 15W) with DDR4 SO-DIMM, Triple Display by Dual HDMI & LVDS, M.2 A-key, PCIe Mini with mSATA, USB 3.2 Gen 2 (10Gb/s), SATA 6Gb/s, Dual COM, Audio and RoHS

WAFER-ULT5

Quick Installation Guide

Version 1.0

November 6, 2019

Package List

WAFER-ULT5 package includes the following items:

- 1 x WAFER-ULT5 single board computer with heat spreader
- 1 x Power cable
- 1 x RS-232/422/485 cable
- 1 x SATA and power cable
- 1 x QIG (Quick Installation Guide)



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Specifications

- SoC:
 - 8th generation Intel® mobile ULT on-board SoC
 - Intel® Core™ i7-8665UE Processor
 - Intel® Core™ i5-8365UE Processor
 - Intel® Core™ i3-8145UE Processor
 - Intel® Celeron® Processor 4305UE
 - Intel® Celeron® Processor 4205UE
- BIOS: AMI UEFI BIOS
- Memory:
 - One 260-pin 2400 MHz DDR4 SO-DIMM slot (system max. 32GB)
- Graphics Engine:
 - Intel® UHD Graphics 620
- Display Output:
 - Triple independent display
 - 2 x HDMI (up to 4096x2160@30Hz)
 - 1 x 18/24-bit dual-channel LVDS by CH7511B DP to LVDS converter (up to 1920x1200@60Hz)
- Embedded Controller: ITE IT8587VG-FX
- Ethernet:
 - 2 x Intel® I211-AT PCIe GbE controller (colay with Intel® I210)
 - 1 x Intel® I219-LM PHY
- External I/O Interfaces:
 - 4 x USB 3.2 Gen 2 (10Gb/s)
 - 3 x RJ-45 GbE
- Internal I/O Interfaces:
 - 1 x RS-232 (1x9 pin, P=1.25mm)
 - 1 x RS-232/422/485 (1x9 pin, P=1.25mm)
 - 2 x USB 2.0 (2x4 pin, P=2.0mm)

- 1 x SATA 6G/s with 5V SATA power connector
- SMBus/I²C: one via 4-pin wafer (1x4)
- Audio:
 - 1 x Analog audio (2x5 pin)
- Front Panel:
 - 1 x Power LED & HDD LED (1x6 pin)
 - 1 x Power button (1x2 pin)
 - 1 x Reset button (1x2 pin)
- LAN LED: 3 x LAN LED (1x2 pin)
- Expansions :
 - 1 x M.2 2230 A-key slot
 - 1 x Full-size PCIe Mini slot (supports mSATA)
- Digital I/O: 1 x 8-bit digital I/O (1x10 pin)
- Fan Connector:
 - 1 x Smart fan connector (1x4 pin)
- Power supply:
 - 12V only DC input
 - 1 x Internal power connector (2x2 pin)
 - Support AT/ATX mode
- Power Consumption:
 - 12V@3.38A (4.6 GHz Intel® Core™ i7-8665UE CPU with 16 GB 2666 MHz DDR4 memory)
- Watchdog Timer:
 - Software programmable supports 1~255 sec. system reset
- Operating Temperature: -20°C ~ 60°C
- Storage Temperature: -30°C ~ 70°C
- Operation Humidity: 5% ~ 95%, non-condensing
- Dimensions:
 - Board: 102mm x 146mm
 - With heat spreader: 107mm x 157 mm
- Weight(GW/ NW): 600g/ 250g

Ordering Information

- **WAFER-ULT5-i7-R10:**

3.5" SBC supports 8th Generation Intel® Core™ i7-8665UE with DDR4 SO-DIMM, triple display by dual HDMI 1.4 & LVDS, triple GbE, USB 3.2 Gen 2, M.2 A-key, PCIe Mini with mSATA support, COM, SATA 6Gb/s, and RoHS

- **WAFER-ULT5-i5-R10:**

3.5" SBC supports 8th Generation Intel® Core™ i5-8365UE with DDR4 SO-DIMM, triple display by dual HDMI 1.4 & LVDS, triple GbE, USB 3.2 Gen 2, M.2 A-key, PCIe Mini with mSATA support, COM, SATA 6Gb/s, and RoHS

- **WAFER-ULT5-i3-R10:**

3.5" SBC supports 8th Generation Intel® Core™ i3-8145UE with DDR4 SO-DIMM, triple display by dual HDMI 1.4 & LVDS, triple GbE, USB 3.2 Gen 2, M.2 A-key, PCIe Mini with mSATA support, COM, SATA 6Gb/s, and RoHS

- **WAFER-ULT5-C-R10:**

3.5" SBC supports 8th Generation Intel® Celeron® 4305UE with DDR4 SO-DIMM, triple display by dual HDMI 1.4 & LVDS, triple GbE, USB 3.2 Gen 2, M.2 A-key, PCIe Mini with mSATA support, COM, SATA 6Gb/s, and RoHS

All the drivers and utilities for the WAFER-ULT5 are available on IEI Resource Download Center. Type WAFER-ULT5 and press Enter to find all the relevant software, utilities, and documentation. To install software from the downloaded ISO file, mount the file as a virtual drive to view its content.

IEI Resource Download Center

<https://download.ieiworld.com>



Jumpers setting and connectors

LABEL	FUNCTION
J_ATX_AT1	Power mode switch
J_CMOS1	Clear CMOS button
JP1	LVDS voltage selection jumper
ME_FLASH1	ME override jumper
HDMI1	External dual HDMI connector
LAN1, LAN2, LAN3	GbE RJ-45 connectors
USB1, USB2	External USB 3.2 Gen 2 connectors
J_AUDIO1	Audio connector
BAT1	Battery connector
DIO1	Digital I/O connector
F_PANEL1	Front panel connector
JLAN_LED1, JLAN_LED2, JLAN_LED3	LAN LED connectors
LVDS1	LVDS connector
INV1	LVDS backlight connector
M2_A1	M.2 2230 A-key slot
MINI_PCIE1	PCIe Mini card slot
PWR2	Power connector
PWR_BTN1	Power button connector
RST_BTN1	Reset button connector
COM1	Internal RS-232/422/485 serial port connector
COM2	Internal RS-232 serial port connector
SATA1	Serial ATA connector
SATA_PWR1	SATA power connector
SMB1	SMBus/I ² C connector
CPU/FAN1	Smart fan connector
JSPI1	SPI flash connector
USB3	Internal USB 2.0 connector

J_ATX_AT1: Power Mode Switch	
PIN NO.	DESCRIPTION
Short A - B	ATX Power Mode (Default)
Short B - C	AT Power Mode

J_CMOS1: Clear CMOS Button	
PIN NO.	DESCRIPTION
Open	Normal Operation (Default)
Push	Clear CMOS Setup

JP1: LVDS Voltage Selection	
PIN NO.	DESCRIPTION
Short 1 - 2	+3.3 V (Default)
Short 2 - 3	+5 V

ME_FLASH1: ME Override	
PIN NO.	DESCRIPTION
1	Pull high 4.7Kohm
2	HDA_SDO_R

LAN1 / LAN2 / LAN3: RJ-45 LAN Connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	MDIA0+	5	MDIA2-
2	MDIA0-	6	MDIA1-
3	MDIA1+	7	MDIA3+
4	MDIA2+	8	MDIA3-

HDMI1: HDMI Connectors			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
A1	HDMI_A_DATA2P	B1	HDMI_B_DATA2P
A2	GND	B2	GND
A3	HDMI_A_DATA2N	B3	HDMI_B_DATA2N
A4	HDMI_A_DATA1P	B4	HDMI_B_DATA1P
A5	GND	B5	GND
A6	HDMI_A_DATA1N	B6	HDMI_B_DATA1N
A7	HDMI_A_DATA0P	B7	HDMI_B_DATA0P
A8	GND	B8	GND
A9	HDMI_A_DATA0N	B9	HDMI_B_DATA0N
A10	HDMI_A_CLKP	B10	HDMI_B_CLKP
A11	GND	B11	GND
A12	HDMI_A_CLKN	B12	HDMI_B_CLKN
A13	N/A	B13	N/A
A14	N/A	B14	N/A
A15	HDMI_A_SCL	B15	HDMI_B_SCL
A16	HDMI_A_SDA	B16	HDMI_B_SDA
A17	GND	B17	GND
A18	+5V	B18	+5V

USB1, USB2: External USB 3.2 Gen 2 (10Gb/s) Connectors			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	USB_VCC	2	USB2_D0-
3	USB2_D0-	4	GND
5	USB3_RXD0-	6	USB3_RXD0+
7	GND	8	USB3_TXD0-
9	USB3_TXD0+	10	USB_VCC
11	USB2_D1-	12	USB2_D1+
13	GND	14	USB3_RXD1-
15	USB3_RXD1+	16	GND
17	USB3_TXD1-	18	USB3_TXD1+

J_AUDIO1: Audio Connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	HDA_SYNC	2	HAD_BCLK
3	HDA_SDO	4	HDA_PCBEOP
5	HAD_SDI0	6	HDA_RST#
7	+5V	8	GND
9	+12V	10	N/C

BAT1: BAT Connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	VBATT	2	GND

DIO1: Digital Input / Output Connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GND	2	+5V
3	Output 3	4	Output 2
5	Output 1	6	Output 0
7	Input 3	8	Input 2
9	Input 1	10	Input 0

F_PANEL1: Front Panel Connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	VCC	2	GND
3	PWR_LED+	4	PWR_LED-
5	HDD_LED+	6	HDD_LED-

JLAN_LED1 / JLAN_LED2 / JLAN_LED3: LAN LED Connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	LED+	2	LED-

LVDS1: LVDS Connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GROUND	2	GROUND
3	LVDS_A_TX0-N	4	LVDS_A_TX1-N
5	LVDS_A_TX0-P	6	LVDS_A_TX1-P
7	GROUND	8	GROUND
9	LVDS_A_TX2-N	10	LVDS_A_TXCLK-N
11	LVDS_A_TX2-P	12	LVDS_A_TXCLK-P
13	GROUND	14	GROUND
15	LVDS_A_TX3-N	16	LVDS_B_TX0-N
17	LVDS_A_TX3-P	18	LVDS_B_TX0-P
19	GROUND	20	GROUND
21	LVDS_B_TX1-N	22	LVDS_B_TX2-N
23	LVDS_B_TX1-P	24	LVDS_B_TX2-P
25	GROUND	26	GROUND
27	LVDS_B_TXCLK-N	28	LVDS_B_TX3-N
29	LVDS_B_TXCLK-P	30	LVDS_B_TX3-P
31	GROUND	32	GROUND
33	GROUND	34	GROUND
35	+LCD VCC	36	+LCD VCC
37	+LCD VCC	38	+LCD VCC
39	+LCD VCC	40	+LCD VCC

INV1: 5-pin Header Inverter Connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	LCD_BKLTCTL	2	GND
3	+12V	4	GND
5	BACKLIGHT ENABLE		

PWR_BTN1: Power Button Connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	PWR_BTN+	2	PWR_BTN-

PWR2: +12V Power Connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GND	2	GND
3	+12V	4	+12V

RST_BTN1: Reset Button Connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	RESET+	2	RESET-

COM1: Internal RS-232/422/485 Serial Port Connector			
PIN NO.	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

COM2: Internal RS-232 Serial Port Connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	DCD	2	DSR
3	RXD	4	RTS
5	TXD	6	CTS
7	DTR	8	RI
9	GND		

SATA1: Serial ATA Connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GND	2	TX+
3	TX-	4	GND
5	RX-	6	RX+
7	GND		

SATA_PWR1: SATA Power Connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	+5V	2	GND

SMB1: SMBus Connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GND	2	SMBUS (I ² C) DATA
3	SMBUS (I ² C) CLOCK	4	+5V

CPU/FAN1: Smart Fan Connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GND	2	+12V
3	Rotation Signal	4	PWM Control Signal

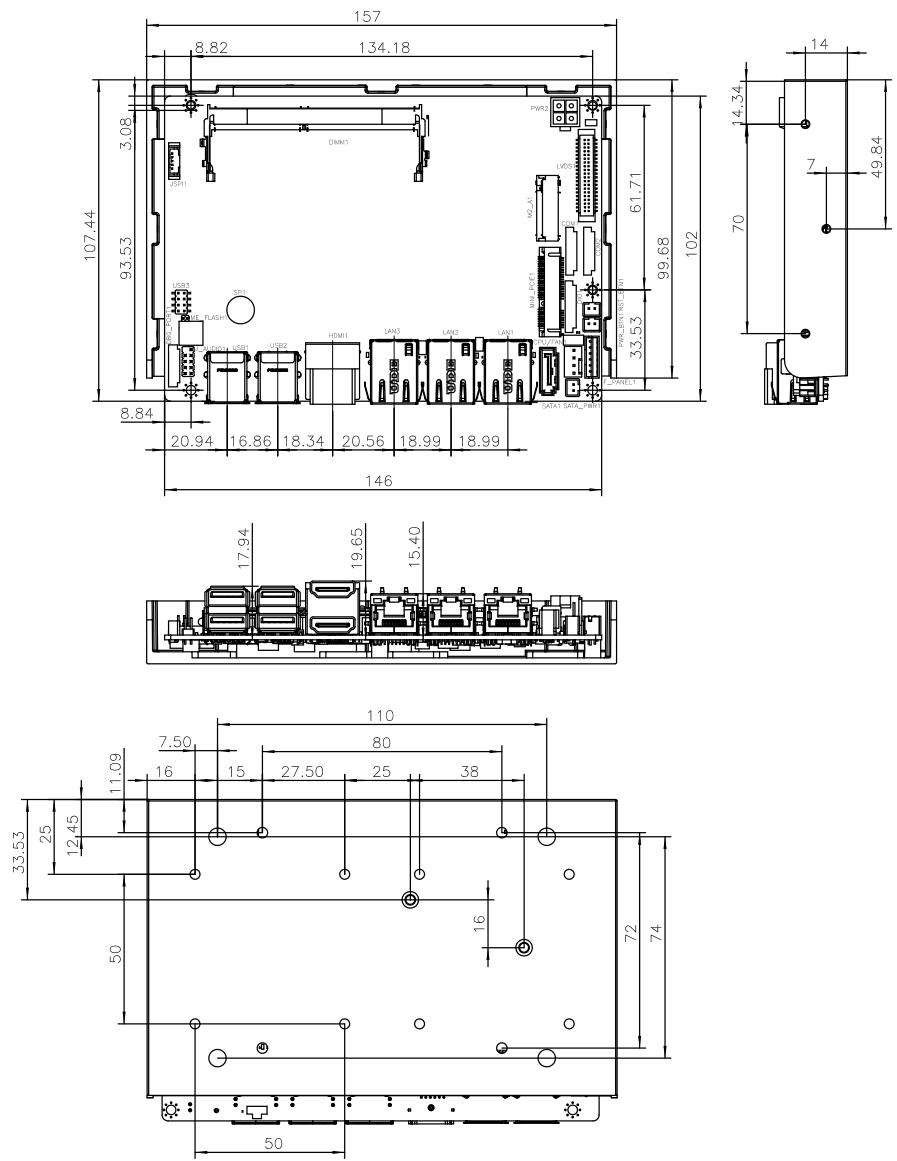
JSPI1: SPI Flash Connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	+3.3V	2	SPI_CS#_SW
3	SPI_SO_SW	4	SPI_CLK_SW
5	SPI_SI_SW	6	GND

USB3: Internal USB 2.0 Connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	VCC	2	GND
3	DATA-	4	DATA+
5	DATA+	6	DATA-
7	GND	8	VCC

MINI_PCIE1: PCIe Mini Card Slot (Full-Size)			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	PCIE_WAKE#	2	VCC3
3	N/C	4	GND
5	N/C	6	1.5V
7	N/C	8	N/C
9	GND	10	N/C
11	PCIE_CLK#	12	N/C
13	PCIE_CLK	14	N/C
15	GND	16	N/C
17	N/C	18	GND
19	N/C	20	N/C
21	GND	22	PCIRST#
23	PCIE_RXN	24	N/C
25	PCIE_RXP	26	GND
27	GND	28	1.5V
29	GND	30	SMBCLK
31	PCIE_TXN	32	SMBDATA
33	PCIE_TXP	34	GND
35	GND	36	USBD-
37	GND	38	USBD+
39	VCC3	40	GND
41	VCC3	42	N/C
43	GND	44	N/C
45	N/C	46	N/C
47	N/C	48	1.5V
49	N/C	50	GND
51	N/C	52	VCC3

M2_A1: M.2 2230 A-key Slot			
PIN NO.	DESCRIPTION	PIN NO.	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
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		

Board Layout: Jumper and Connector Locations



(Unit: mm)