

**3.5" SBC supports Intel® 6th/7th Generation ULT processor with  
DDR4 SO-DIMM / on board memory support, triple display,  
PCIe mini with SIM card slot / mSATA support,  
SATA 6Gb/s, COM, Audio, and RoHS**

# **WAFER-ULT3 WAFER-ULT4**

## **Quick Installation Guide** **Version 1.0**

Oct.18, 2017

### **Package List**

WAFER-ULT3/WAFER-ULT4 package includes the following items:

- 1 x WAFER-ULT3/ULT4 single board computer
- 1 x Power cable
- 1 x RS-232/422/485 cable
- 1 x SATA with power cable kit
- 1 x One Key Recovery CD
- 1 x QIG
- 1 x Utility CD



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## Specifications

- CPU:
  - 7th generation Intel® mobile ULT Processor
    - Intel® Core™ i7-7600U (up to 3.9GHz, dual-core, 4MB cache, TDP=15W)
    - Intel® Core™ i5-7300U (up to 3.5GHz, dual-core, 3MB cache, TDP=15W)
    - Intel® Core™ i3-7100U (up to 2.4GHz, dual-core, 3MB cache, TDP=15W)
  - 6th generation Intel® mobile ULT Processor
    - Intel® Core™ i7-6600U (up to 3.4GHz, dual-core, 4MB cache, TDP=15W)
    - Intel® Core™ i5-6300U (up to 3.0GHz, dual-core, 3MB cache, TDP=15W)
    - Intel® Core™ i3-6100U (up to 2.3GHz, dual-core, 3MB cache, TDP=15W)
  - Intel® Celeron® processor 3955U (up to 2.0GHz, dual-core, 2MB cache, TDP=15W)
  - Intel® Celeron® processor 3855U (up to 1.6GHz, dual-core, 2MB cache, TDP=15W)
- Memory:
  - 1 x 260-pin 2133MHz DDR4 SDRAM SO-DIMM (channel 1)
  - On board DDR4 memory (channel 2, optional 4GB/8GB support by request)
- BIOS: AMI UEFI BIOS
- Graphics Engine: Intel® HD graphic
- Display Output:
  - Triple Independent Displays
  - 1 x VGA (up to 1920x1200@60Hz)
  - 1 x HDMI (up to 4096x2160@30Hz)
  - 1 x 18/24-bit dual-channel LVDS (up to 1920x1200@60Hz)
  - 1 x iDP interface for HDMI, LVDS, VGA, DVI, DP (co-layout with VGA)

- Ethernet:
  - 1 x Intel® I219LM
  - 1 x Intel® I211AT
- External I/O Interfaces:
  - 4 x USB 3.0
- Internal I/O Interfaces:
  - 1 x SATA 6G/s with 5V SATA power connector
  - 2 x USB 2.0 (2x4 pin, P=2.0)
  - 2 x RS-232/422/485 (1x9 pin, P=1.25)
- SMBus: 1 x SMBus (1x4 pin, P=2.0)
- Audio:
  - 1 x HD audio (2x5 pin, support 7.1 channel HD audio by AC-KIT-892HD-R10)
- Front Panel:
  - 1 x Power LED & HDD LED (1x6 pin)
  - 1 x Power button (1x2 pin)
  - 1 x Reset button (1x2 pin)
- Expansion:
  - 1 x Full-size PCIe Mini slot (w/ SATA signal, support mSATA)
  - 1 x Full-size PCIe Mini slot (w/ SIM card slot support)
  - \*3855U belongs to Skylake ULT Base series CPU, PCIe signal support only PCIe Gen 2*
- Digital I/O: 1 x 8-bit digital I/O (2x5 pin)
- Fan Connector:
  - 1 x System fan connector (1x4 pin)
- Watchdog Timer:
  - Software programmable, supports 1~255 sec. system reset
- Power Supply:
  - 12V only DC input
  - 1 x internal power connector (2x2 pin, or optional terminal block)
- Power Consumption:

12V@4.27A (Intel® Core™ i7-6600U up to 3.4GHz CPU with 16GB (16GB x1) DDR4-2133 memory running in 3.0GHz)

- Operating Temperature: -20°C ~ 60°C
- Storage Temperature: -20°C ~ 60°C
- Operating Humidity: 5% ~ 95%, non-condensing
- Dimensions: 146 mm x 102 mm
- Weight (GW/NW): 600 g/250 g

## Ordering Information

- **WAFER-ULT3-i7-R10:**

3.5" SBC supports Intel® 6th Generation ULT Core™ i7-6600U processor with DDR4 SO-DIMM, triple display with VGA/iDP, HDMI, LVDS, Dual GbE, PCIe mini with SIM card slot/mSATA support, SATA 6Gb/s, COM, and RoHS

- **WAFER-ULT3-i5-R10:**

3.5" SBC supports Intel® 6th Generation ULT Core™ i5-6300U processor with DDR4 SO-DIMM, triple display with VGA/iDP, HDMI, LVDS, Dual GbE, PCIe mini with SIM card slot/mSATA support, SATA 6Gb/s, COM, and RoHS

- **WAFER-ULT3-i3-R10:**

3.5" SBC supports Intel® 6th Generation ULT Core™ i3-6100U processor with DDR4 SO-DIMM, triple display with VGA/iDP, HDMI, LVDS, Dual GbE, PCIe mini with SIM card slot/mSATA support, SATA 6Gb/s, COM, and RoHS

- **WAFER-ULT3-C-R10:**

3.5" SBC supports Intel® 6th Generation ULT Celeron® 3955U processor with DDR4 SO-DIMM, triple display with VGA/iDP, HDMI, LVDS, Dual GbE, PCIe mini with SIM card slot/mSATA

support, SATA 6Gb/s, COM, and RoHS

- **WAFER-ULT3-CE-R10:**

3.5" SBC supports Intel® 6th Generation ULT Celeron® 3855U processor with DDR4 SO-DIMM, triple display with VGA/iDP, HDMI, LVDS, Dual GbE, PCIe mini with SIM card slot/mSATA support, SATA 6Gb/s, COM, and RoHS

- **WAFER-ULT4-i7-R10\*\*:**

3.5" SBC supports Intel® 7th Generation ULT Core™ i7-7600U processor with DDR4 SO-DIMM, triple display with VGA/iDP, HDMI, LVDS, Dual GbE, PCIe mini with SIM card slot/mSATA support, SATA 6Gb/s, COM, and RoHS

- **WAFER-ULT4-i5-R10:**

3.5" SBC supports Intel® 7th Generation ULT Core™ i5-7300U processor with DDR4 SO-DIMM, triple display with VGA/iDP, HDMI, LVDS, Dual GbE, PCIe mini with SIM card slot/mSATA support, SATA 6Gb/s, COM, and RoHS

- **WAFER-ULT4-i3-R10\*\*:**

3.5" SBC supports Intel® 7th Generation ULT Core™ i3-7100U processor with DDR4 SO-DIMM, triple display with VGA/iDP, HDMI, LVDS, Dual GbE, PCIe mini with SIM card slot/mSATA support, SATA 6Gb/s, COM, and RoHS

- **34000-000673-RS:**

optional FANLESS heatsink module, 146 x 102 x 16mm

*\*\*By order production, MOQ:100*

## Jumper Settings and Connectors

<b>LABEL</b>	<b>FUNCTION</b>
J_ATX_AT1	AT/ATX Power Mode Setting
J_CMOS1	CMOS Setup Keep / Clear
JP1	LVDS1 Voltage Selection
SW2	Serial Port 1/Serial Port 2 Transfer Mode Selection
J_VGA_DP1	VGA & DP Mode Selection
SW1	LVDS Panel Resolution Selection
HDMI1	External HDMI Connector
LAN1, LAN2	RJ-45 LAN connectors
USB_CON1 USB_CON2	External USB 3.0 Connectors
USB1	Internal USB 2.0 connectors
COM1, COM2	Internal RS-232/422/485 Serial Port Connectors
AUDIO1	Audio Connector
SATA1	Serial ATA 3.0 connector
SATA_PWR1	SATA power connector
LVDS1	LVDS1 connector
INV1	LVDS Backlight Connector
F_PANEL1	Power & HDD LED connector
RST_BTN1	Reset button connector
PWR_BTN1	Power button connector
PWR1	+12V Power Connector
MINI_PCIE1	Mini PCI-E Card Connector(Support SIM Card)
MINI_PCIE2	Mini PCI-E Card Connector(Support mSATA)
DIO1	Digital I/O connector
SMB1	SMBus connector
CPU_FAN1	CPU Fan Connector
SIM1	SIM Card Connector
DP1	Internal DisplayPort Connector
VGA1	VGA connector

ME_FLASH1	Internal ME Override Connector
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<b>J_ATX_AT1: AT/ATX Power Mode Setting</b>	
<b>PIN NO.</b>	<b>DESCRIPTION</b>
Short A - B	ATX Power Mode (Default)
Short B - C	AT Power Mode

<b>J_CMOS1: CMOS Setup Keep / Clear</b>	
<b>PIN NO.</b>	<b>DESCRIPTION</b>
NC (Default)	Keep CMOS Setup (Normal Operation)
Press button	Clear CMOS Setup

<b>JP1: LVDS1 Voltage Selection</b>	
<b>PIN NO.</b>	<b>DESCRIPTION</b>
Short 1 - 2	+3.3 V (Default)
Short 2 - 3	+5 V

<b>SW2 : Serial Port 1 Transfer Mode Selection (ON=0 , OFF=1)</b>		
<b>SW2:1</b>	<b>SW2:2</b>	<b>DESCRIPTION</b>
ON	ON	RS422
ON	OFF	RS232 (Default)
OFF	ON	RS485

<b>SW2 : Serial Port 2 Transfer Mode Selection (ON=0 , OFF=1)</b>		
<b>SW2:3</b>	<b>SW2:4</b>	<b>DESCRIPTION</b>
ON	ON	RS422
ON	OFF	RS232 (Default)
OFF	ON	RS485

<b>J_VGA_DP1: VGA &amp; DP Mode Selection</b>	
<b>PIN NO.</b>	<b>DESCRIPTION</b>
Short A - B	VGA Mode (Default)
Short B - C	DP Mode

<b>SW1: LVDS Panel Resolution Selection</b>	
* ON=0, OFF=1; Single=S, Dual=D	
<b>4-3-2-1</b>	<b>DESCRIPTION</b>
0000	800x600 18bit S (default)
0001	1024x768 18bit S
0010	1024x768 24bit S
0011	1280x768 18bit S
0100	1280x800 18bit S
0101	1280x960 18bit S
0110	1280x1024 24bit D
0111	1366x768 18bit S
1000	1366x768 24bit S
1001	1440x900 24bit D
1010	1400x1050 24bit D
1011	1600x900 24bit D
1100	1680x1050 24bit D
1101	1600x1200 24bit D
1110	1920x1080 24bit D
1111	1920x1200 24bit D

<b>HDMI1: External HDMI Connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
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	20	HDMI_GND
21	HDMI_GND	22	HDMI_GND
23	HDMI_GND		



<b>LAN1: RJ-45 LAN connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	LAN1_MDI0+	7	LAN1_MDI2+
2	LAN1_MDI0-	8	LAN1_MDI2-
3	LAN1_MDI1+	9	LAN1_MDI3+
4	LAN1_MDI1-	10	LAN1_MDI3-

<b>LAN2: RJ-45 LAN connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	LAN2_MDI0+	7	LAN2_MDI2+
2	LAN2_MDI0-	8	LAN2_MDI2-
3	LAN2_MDI1+	9	LAN2_MDI3+
4	LAN2_MDI1-	10	LAN2_MDI3-

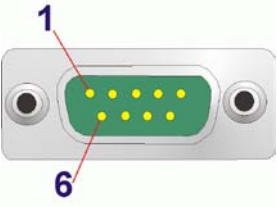
<b>USB_CON1, USB_CON2: External USB 3.0 Connectors</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	USB_VCC	2	USB2_D0-
3	USB2_D0-	4	GND
5	USB3_RXD0-	6	USB3_RXD0+
7	GND	8	USB3_TXD0-
9	USB3_TXD0+	10	USB_VCC
11	USB2_D1-	12	USB2_D1+
13	GND	14	USB3_RXD1-
15	USB3_RXD1+	16	GND
17	USB3_TXD1-	18	USB3_TXD1+

<b>USB1: Internal USB 2.0 Connectors</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	USB_VCC	2	GND
3	DATA-	4	DATA+
5	DATA+	6	DATA-
7	GND	8	USB_VCC

<b>COM1, COM2: Internal RS-232/422/485 Serial Port Connectors</b>			
<b>Mode</b>	<b>RS232</b>	<b>RS422</b>	<b>RS485</b>
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>DESCRIPTION</b>	<b>DESCRIPTION</b>
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

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

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



The diagram shows a DB-9 connector with a green PCB. Pin 1 is the top-left pin, and pin 6 is the bottom-right pin. Red lines with numbers 1 and 6 point to these specific pins.

<b>J_AUDIO1: Audio Connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	HDA_SYNC	2	HDA_CLK
3	HDA_SDO	4	HAD_BEEP
5	HDA_SDI	6	HDS_RESET
7	+5V	8	AUD_GND
9	+12V	10	AUD_GND

<b>SATA1: Serial ATA 3.0 connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	GND	5	RX-
2	TX+	6	RX+
3	TX-	7	GND
4	GND	8	N/C

<b>SATA_PWR1: SATA power connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	+5V	2	GND

<b>LVDS1: LVDS connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	GND	2	GND
3	A_Y0#	4	A_Y1#
5	A_Y0	6	A_Y1
7	GND	8	GND
9	A_Y2#	10	A_CK#
11	A_Y2	12	A_CK
13	GND	14	GND
15	A_Y3#	16	B_Y0#
17	A_Y3	18	B_Y0
19	GND	20	GND
21	B_Y1#	22	B_Y2#
23	B_Y1	24	B_Y2
25	GND	26	GND
27	B_CK#	28	B_Y3#
29	B_CK	30	B_Y3
31	GND	32	GND
33	GND	34	GND
35	LVDS_VCC	36	LVDS_VCC
37	LVDS_VCC	38	LVDS_VCC
39	LVDS_VCC	40	LVDS_VCC

<b>INV1: LVDS Backlight Connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	LCD_BKLTCTL	2	GND
3	+12V	4	GND
5	BACKLIGHT ENABLE		

<b>F_PANEL1: Power &amp; HDD LED connector</b>				
	<b>PIN</b>	<b>DESCRIPTION</b>	<b>PIN</b>	<b>DESCRIPTION</b>
+5V	1	VCC	2	GND
Power LED	3	PWR_LED+	4	PWR_LED-
HDD LED	5	HDD_LED+	6	HDD_LED-

<b>RST_BTN1: Reset Button Connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	RESET+	2	RESET-

<b>PWR_BTN1: Power Button Connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	PWR_BTN+	2	PWR_BTN-

<b>PWR1: +12V Power Connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	GND	2	GND
3	+12V	4	+12V

<b>DIO1: Digital I/O connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	GND	2	VCC
3	DOUT3	4	DOUT2
5	DOUT1	6	DOUT0
7	DIN3	8	DIN2
9	DIN1	10	DIN0

<b>ME_FLASH1: Internal ME Override Connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	SRC_RST_N	2	GND

<b>MINI_PCIE1: Mini PCI-E Card Connector(Support SIM Card)</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	PCIE_WAKE#	2	VCC3
3	N/C	4	GND
5	N/C	6	1.5V
7	N/C	8	UIM_PWR
9	GND	10	UIM_DATA
11	PCIE_CLK#	12	UIM_CLK
13	PCIE_CLK	14	UIM_RST
15	GND	16	UIM_VPP
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	USB D-
37	GND	38	USB D+
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

<b>MINI_PCIE2: Mini PCI-E Card Connector(Support mSATA)</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
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(SATA_RX+)	24	N/C
25	PCIE_RXP(SATA_RX-)	26	GND
27	GND	28	1.5V
29	GND	30	SMBCLK
31	PCIE_TXN(SATA_TX-)	32	SMBDATA
33	PCIE_TXP(SATA_TX+)	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

<b>SMB1: SMBus Connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	GND	2	SMBUS(I2C) DATA
3	SMBUS(I2C) CLK	4	+5V

<b>CPU_FAN1: CPU Fan Connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	GND	2	+12V
3	Rotation Signal	4	PWM Control Signal

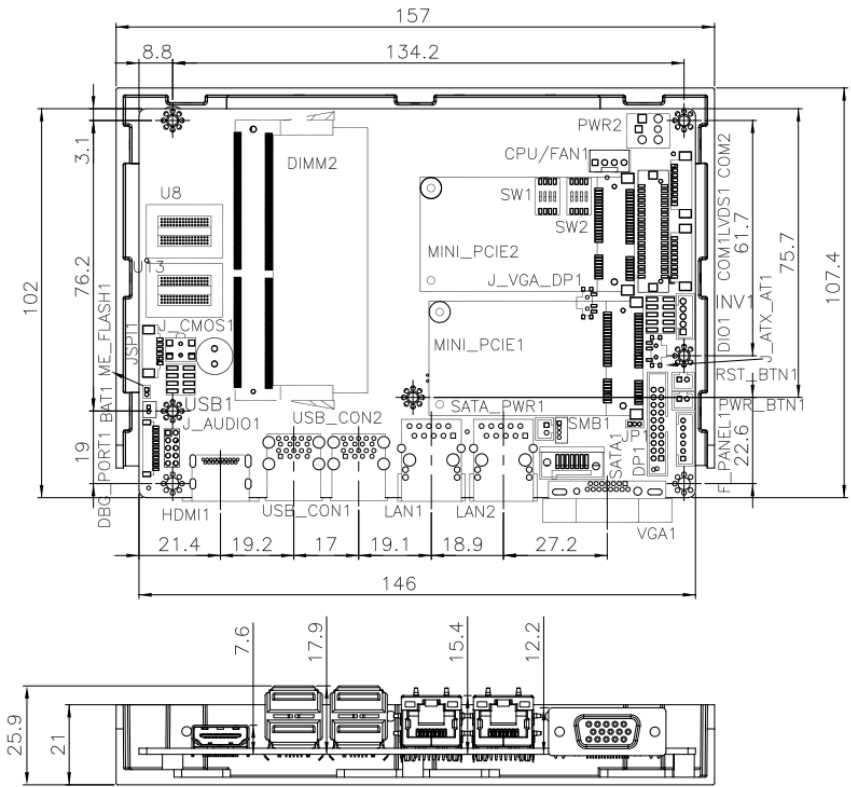
<b>SIM1: SIM Card Connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	SIM_VCC	2	SIM_RST
3	SIM_Clock	4	GND
5	SIM_VPP	6	SIM_DATA

<b>DP1: Internal DisplayPort Connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	HPD	2	AUXP
3	GND	4	AUXN
5	NC	6	GND
7	GND	8	LANE2P
9	LANE3P	10	LANE2N
11	LANE3N	12	GND
13	GND	14	LANE0P
15	LANE1P	16	LANE0N
17	LANE1N	18	+3.3V
19	+5V	20	NC

<b>VGA1: VGA connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	RED	2	GREEN
3	BLUE	4	NC
5	GND	6	GND
7	GND	8	GND
9	VCC	10	GND
11	NC	12	DDCDA
13	HSYNC	14	VSYNC
15	DDCCLK		

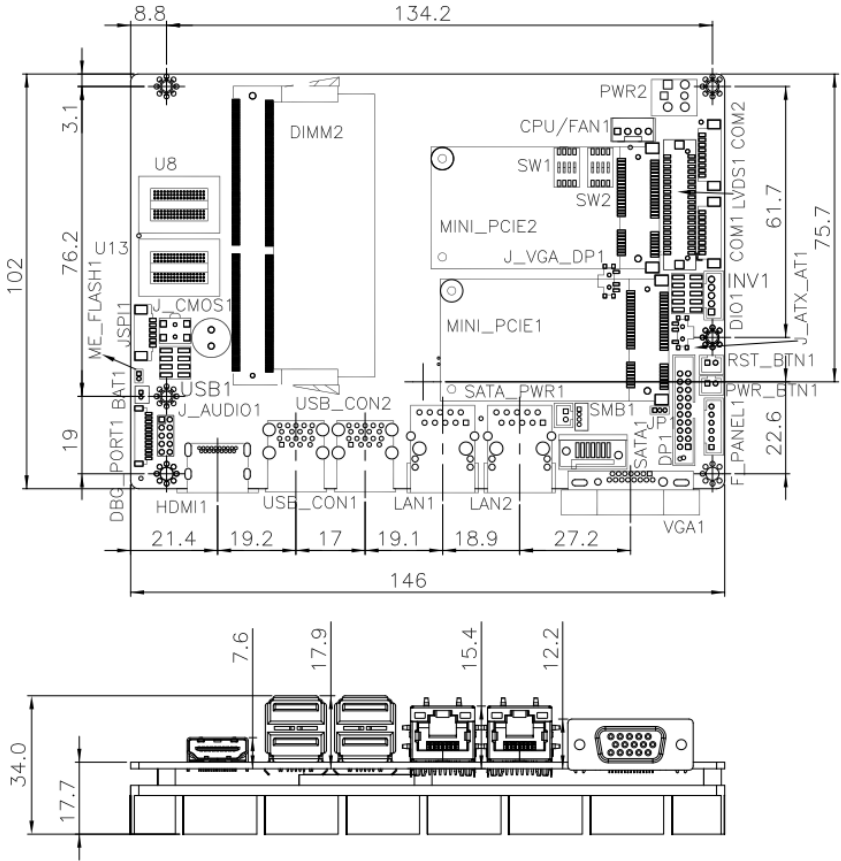


# Board Layout: Jumper and Connector Locations



**Heat spreader(default)**

**(Unit: mm)**



**Heatsink(by optional order)**

**(Unit: mm)**