

**3.5" SBC supports Intel® 22nm 4<sup>th</sup> / 14nm 5<sup>th</sup> Generation Mobile Core™ i7/i5/i3 and Celeron® on-board Processor (ULT), VGA, LVDS, iDP, Dual GbE, PCIe Mini, USB 3.0, SATA 6Gb/s, Audio, iRIS-1010 and RoHS**

# **WAFER-ULT-i1 WAFER-ULT2-i1**

## **Quick Installation Guide** **Version 1.1**

August 2015

### **Package List**

WAFER-ULT-i1/WAFER-ULT2-i1 package includes the following items:

- 1 x WAFER-ULT-i1/WAFER-ULT2-i1 single board computer with enclosure heatsink
- 2 x SATA with 5V output cable kit
- 1 x Audio cable
- 1 x Dual-port USB 2.0 cable
- 1 x Power cable
- 1 x One Key Recovery CD
- 1 x QIG
- 1 x Utility CD



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## Specifications

- CPU:
  - Intel® 5th generation mobile ULT on-board SoC
    - Intel® Core™ i7-5650U (2.2GHz, dual-core, 4MB cache, TDP=15W)
    - Intel® Core™ i5-5350U (1.8GHz, dual-core, 3MB cache, TDP=15W)
    - Intel® Core™ i3-5010U (2.1GHz, dual-core, 3MB cache, TDP=15W)
    - Intel® Celeron® processor 3765U (1.9GHz, dual-core, 2MB cache, TDP=15W)
  - Intel® 4th generation mobile ULT on-board SoC
    - Intel® Core™ i7-4650U (1.7GHz, dual-core, 4MB cache, TDP=15W)
    - Intel® Core™ i5-4300U (1.9GHz, dual-core, 3MB cache, TDP=15W)
    - Intel® Core™ i3-4010U (1.7GHz, dual-core, 3MB cache, TDP=15W)
    - Intel® Celeron® processor 2980U (1.6GHz, dual-core, 2MB cache, TDP=15W)
- Memory:
  - Two 204-pin 1600/1333 MHz dual-channel unbuffered DDR3L SDRAM SO-DIMMs support up to 16 GB
- BIOS: UEFI BIOS
- Graphics:
  - Intel® 5th generation mobile ULT on-board SoC
    - Intel® HD Graphics Gen 8 supports DX11.1, OpenGL 4.2 and OpenCL 1.2 Full MPEG2, VC1, AVC decode
  - Intel® 4th generation mobile ULT on-board SoC
    - Intel® HD Graphics Gen 7.5 supports DX11.1, OpenGL 4.2 and OpenCL 1.2 Full MPEG2, VC1, AVC decode

- Display Output:
  - Triple independent display
  - VGA (up to 2560x1600@60Hz)
  - 18/24-bit dual-channel LVDS by CH7511B DP to LVDS converter (up to 1920x1200@60Hz)
  - iDP interface for HDMI, LVDS, VGA, DVI, DP (up to 3840x2160@60 Hz)
- Ethernet:
  - GbE1: Intel® I218LM PHY with Intel® AMT 9.0 support
  - GbE2: Intel® I210-AT PCIe controller with NCSI support
- Super IO: Fintek F81866
- External I/O Interfaces:
  - 1 x RS-232
  - 2 x USB 3.0
- Internal I/O Interfaces:
  - 1 x KB/MS (1x6 pin)
  - 1 x RS-422/485 (1x4 pin, P=2.0)
  - 2 x RS-232 (2x5 pin, P=2.0)
  - 2 x SATA 6Gb/s with 5V power connector (no RAID)
  - 2 x USB 2.0 (2x4 pin, P=2.0)
- iRIS Remote Management Module: 1 x iRIS-1010 slot
- Expansion:
  - 1 x Full-size/half-size PCIe Mini card slot (mSATA support)
- 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:
  - 2 x LAN LED (1x2 pin)

- Digital I/O: 1 x 8-bit digital I/O (2x5 pin)
- Fan Connector:  
1 x System smart fan (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)  
Support AT/ATX mode
- Power Consumption:  
12V@2.72A (Intel® Core™ i5-4300U CPU with two 8GB  
1600MHz DDR3L memory)
- Operating Temperature: -10°C ~ 60°C
- Storage Temperature: -20°C ~ 70°C
- Operating Humidity: 5% ~ 95%, non-condensing
- Dimensions: 146 mm x 102 mm
- Weight (GW/NW): 600 g/250 g

## Ordering Information

- **WAFER-ULT-i1-i7-R11:**  
3.5" SBC with Intel® 22nm 4th Generation ULT Mobile Core™ i7-4650U processor (ULT), VGA, LVDS, iDP, Dual GbE, USB 3.0, PCIe Mini, SATA 6Gb/s, iRIS-1010 and RoHS
- **WAFER-ULT-i1-i5-R11:**  
3.5" SBC with Intel® 22nm 4th Gen ULT Mobile Core™ i5-4300U processor (ULT), VGA, LVDS, iDP, Dual GbE, USB 3.0, PCIe Mini, SATA 6Gb/s, iRIS-1010 and RoHS
- **WAFER-ULT-i1-i3-R11:**  
3.5" SBC with Intel® 22nm 4th Gen ULT Mobile Core™ i3-4010U processor (ULT), VGA, LVDS, iDP, Dual GbE, USB 3.0, PCIe Mini, SATA 6Gb/s, iRIS-1010 and RoHS
- **WAFER-ULT-i1-C-R11:**  
3.5" SBC with Intel® 22nm 4th Gen ULT Mobile Celeron® 2980U processor (ULT), VGA, LVDS, iDP, Dual GbE, USB 3.0, PCIe Mini, SATA 6Gb/s, iRIS-1010 and RoHS
- **WAFER-ULT2-i1-i7-R11:**  
3.5" SBC with Intel® 14nm 5th Gen ULT Mobile Core™ i7-5650U processor (ULT), VGA, LVDS, iDP, Dual GbE, USB 3.0, PCIe Mini, SATA 6Gb/s, iRIS-1010 and RoHS
- **WAFER-ULT2-i1-i5-R11:**  
3.5" SBC with Intel® 14nm 5th Gen ULT Mobile Core™ i5-5350U processor (ULT), VGA, LVDS, iDP, Dual GbE, USB 3.0, PCIe Mini, SATA 6Gb/s, iRIS-1010 and RoHS

- **WAFER-ULT2-i1-i3-R11:**  
3.5" SBC with Intel® 14nm 5th Gen ULT Mobile Core™ i3-5010U processor (ULT), VGA, LVDS, iDP, Dual GbE, USB 3.0, PCIe Mini, SATA 6Gb/s, iRIS-1010 and RoHS
- **WAFER-ULT2-i1-C-R11:**  
3.5" SBC with Intel® 14nm 5th Gen ULT Mobile Celeron 3765U processor (ULT), VGA, LVDS, iDP, Dual GbE, USB 3.0, PCIe Mini, SATA 6Gb/s, iRIS-1010 and RoHS
- **iRIS-1010-R10:**  
IPMI 2.0 adapter card with AST1010 BMC chip  
(w/o KVM over IP function) for PCIe Mini socket interface
- **32000-023800-RS:** PS/2 KB/MS cable
- **19800-000300-200-RS:** RS-232 cable
- **32205-003800-300-RS:** RS-422/485 cable, 200mm
- **DP-LVDS-R10:**  
DisplayPort to 24-bit dual-channel LVDS converter board  
(for IEI iDP connector)
- **DP-HDMI-R10:**  
DisplayPort to HDMI converter board (for IEI iDP connector)
- **DP-DVI-R10:**  
DisplayPort to DVI-D converter board (for IEI iDP connector)
- **DP-VGA-R10:**  
DisplayPort to VGA converter board (for IEI iDP connector)
- **DP-DP-R10:**  
DisplayPort converter board (for IEI iDP connector)

## Jumper Settings and Connectors

LABEL	FUNCTION
J_ATX_AT1	AT/ATX mode select switch
J_CMOS1	Clear CMOS button
JP1	LVDS1 voltage selection
LVDSBL_DC5V1	DC 5V jumper for LVDS backlight
SW1	LVDS panel resolution selection
FAN1	CPU fan connector
DIO1	Digital I/O connector
DP1	Internal DisplayPort connector
AUDIO1	HD audio connector
IPMI1	IPMI iRIS-1010 module slot
KB_MS1	Keyboard and mouse connector
LVDS1	LVDS1 panel connector
INV1	LVDS1 panel backlight +12V power source
LVDSBL_DC5V1	LVDS backlight to 5V DC
M_PCIE2	PCIe Mini card slot with mSATA support
CN2	Power & HDD LED connector
RST_BTN1	Reset button connector
PWR_BTN1	Power button connector
CN1	DC power input connector
COM2, COM3	RS-232 serial port connectors
COM4	RS-422/485 serial port connector
SATA1, SATA2	SATA 6Gb/s drive connectors
SATA_PWR1, SATA_PWR2	SATA power connectors
CN3	SMBus connector
LED_LAN1, LED_LAN2	LAN Link LED connector
CN5	EC debug port connector
CHASSIS1	Chassis status connector
ID_LED1	ID LED Connector
USB1	Internal USB 2.0 connectors
LAN1, LAN2	RJ-45 LAN connectors

<b>LABEL</b>	<b>FUNCTION</b>
USB_CON1	External USB 3.0 ports
COM1	External RS-232 serial port connector
VGA1	VGA connector

<b>J_ATX_AT1: AT/ATX mode select switch</b>	
<b>PIN NO.</b>	<b>DESCRIPTION</b>
Short 1 - 2	ATX Mode (Default)
Short 2 - 3	AT Mode

<b>J_CMOS1: Clear CMOS button</b>	
<b>PIN NO.</b>	<b>DESCRIPTION</b>
Push	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>LVDSBL_DC5V1: DC 5V jumper for LVDS backlight</b>	
<b>PIN NO.</b>	<b>DESCRIPTION</b>
Open	By BIOS Setting (Default)
Short 1 - 2	Locked to DC 5V



<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>FAN1: CPU fan connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	GND	2	+12V
3	FANIO	4	PWM

<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	Output 3	4	Output 2
5	Output 1	6	Output 0
7	Input 3	8	Input 2
9	Input 1	10	Input 0

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

<b>AUDIO1: HD audio connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	LINEOUT1R	2	LINE1_R
3	AUD_GND	4	AUD_GND
5	LINEOUT1L	6	LINE1_L
7	AUD_GND	8	AUD_GND
9	FMIC1_R	10	FMIC1_L

<b>KB_MS1: Keyboard and mouse connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	VCC	2	MSDATA
3	MSCLK	4	KBDATA
5	KBCLK	6	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	LVDS_DATA0	4	LVDS_DATA0#
5	LVDS_DATA1	6	LVDS_DATA1#
7	LVDS_DATA2	8	LVDS_DATA2#
9	LVDS_CLK1	10	LVDS_CLK1#
11	LVDS_DATA3	12	LVDS_DATA3#
13	GND	14	GND
15	LVDS_DATA4	16	LVDS_DATA4#
17	LVDS_DATA5	18	LVDS_DATA5#
19	LVDS_DATA6	20	LVDS_DATA6#
21	LVDS_CLK2	22	LVDS_CLK2#
23	LVDS_DATA7	24	LVDS_DATA7#
25	GND	26	GND
27	VCC_LCD	28	VCC_LCD
29	VCC_LCD	30	VCC_LCD

<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>LVDSBL_DC5V1:LVDS backlight to 5V DC</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	EC_BKLT_DC5V	2	GND

<b>M_PCIE2: PCIe Mini / mSATA card slot</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	24	VCC3
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	M-SATA Detect	52	VCC3

<b>CN2: 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	PWRLED	4	GND
HDD LED	5	VCC	6	HDDLED

<b>RST_BTN1: Reset button connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	SYSRST	2	GND

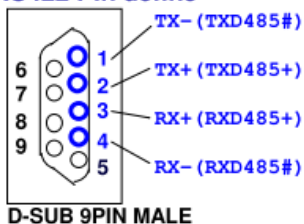
<b>PWR_BTN1: Power button connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	PWRBTW#	2	GND

<b>CN1: Power source connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	GND	2	GND
3	+12V	4	+12V

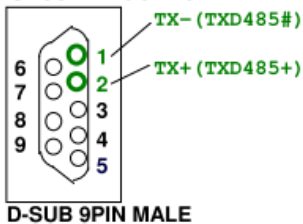
<b>COM2, COM3: RS-232 serial port connectors</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	DCD	2	DSR
3	RXD	4	RTS
5	TXD	6	CTS
7	DTR	8	RI
9	GND	10	GND

COM4: RS-422/485 serial port connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	RXD485#	2	RXD485+
3	TXD485+	4	TXD485#

RS422 Pin define



RS485 Pin define



SATA1, SATA2: Serial ATA 3.0 connectors			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GND	2	TX+
3	TX-	4	GND
5	RX-	6	RX+
7	GND		

SATA_PWR1, SATA_PWR2: SATA power connectors			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	+5V	2	GND

CN3: SMBus connector			
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GND	2	SMBUS DATA
3	SMBUS CLK	4	+5V

LED_LAN1: LAN Link LED connector			
PIN	DESCRIPTION	PIN	DESCRIPTION
1	+3.3V	2	LAN1_LED_LNK#_ACT

<b>LED_LAN2: LAN Link LED connector</b>			
<b>PIN</b>	<b>DESCRIPTION</b>	<b>PIN</b>	<b>DESCRIPTION</b>
1	+3.3V	2	LAN2_LED_LNK#_ACT

<b>CN5: EC debug port connector</b>			
<b>PIN</b>	<b>DESCRIPTION</b>	<b>PIN</b>	<b>DESCRIPTION</b>
1	EC_SMBCLK	2	EC_SMBDAT

<b>CHASSIS1: Chassis status connector</b>			
<b>PIN</b>	<b>DESCRIPTION</b>	<b>PIN</b>	<b>DESCRIPTION</b>
1	+3.3VSB	2	CHASSIS OPEN

<b>ID_LED1: ID LED Connector</b>			
<b>PIN</b>	<b>DESCRIPTION</b>	<b>PIN</b>	<b>DESCRIPTION</b>
1	+5VSB	2	LED Control

<b>USB1: Internal USB 2.0 connector</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>USB_CON1: External USB 3.0 ports</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	VCC	10	VCC
2	D-	11	D-
3	D+	12	D+
4	GND	13	GND
5	RX-	14	RX-
6	RX+	15	RX+
7	GND	16	GND
8	TX-	17	TX-
9	TX+	18	TX+

<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-

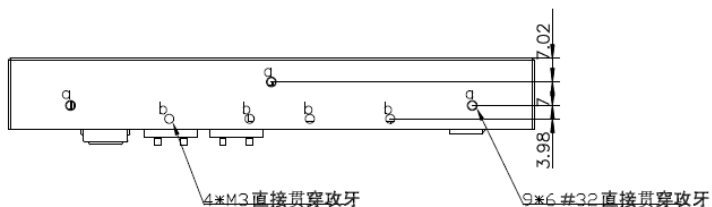
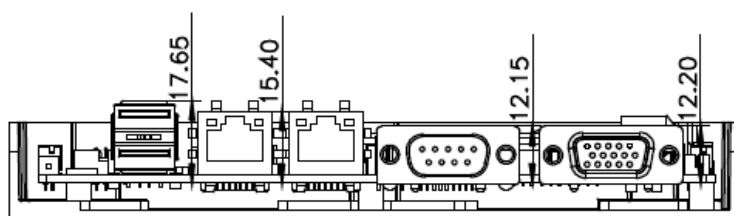
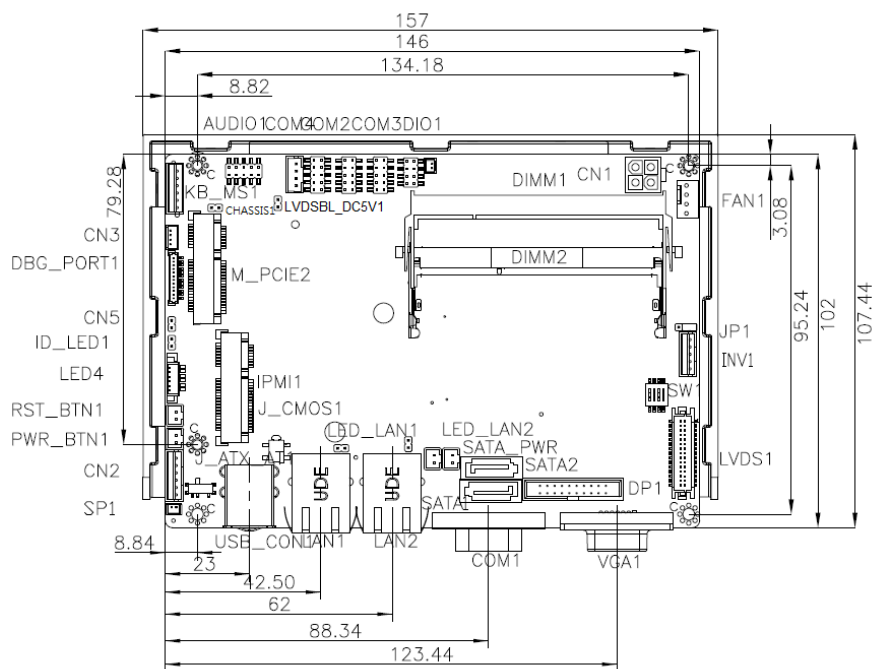
<b>LAN2: RJ-45 LAN connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	LAN2_MDI0+	7	LAN2_MDI2+
2	LAN2_MDI0-	8	LAN2_MDI2-
3	LAN2_MDI1+	9	LAN2_MDI3+
4	LAN2_MDI1-	10	LAN2_MDI3-

<b>COM1: RS-232 serial port connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	DCD	2	RXD
3	TXD	4	DTR
5	GND	6	DSR
7	RTS	8	CTS
9	RI		

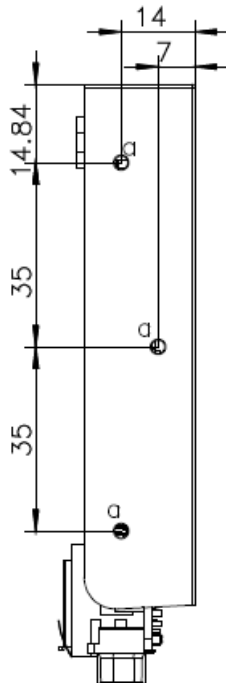
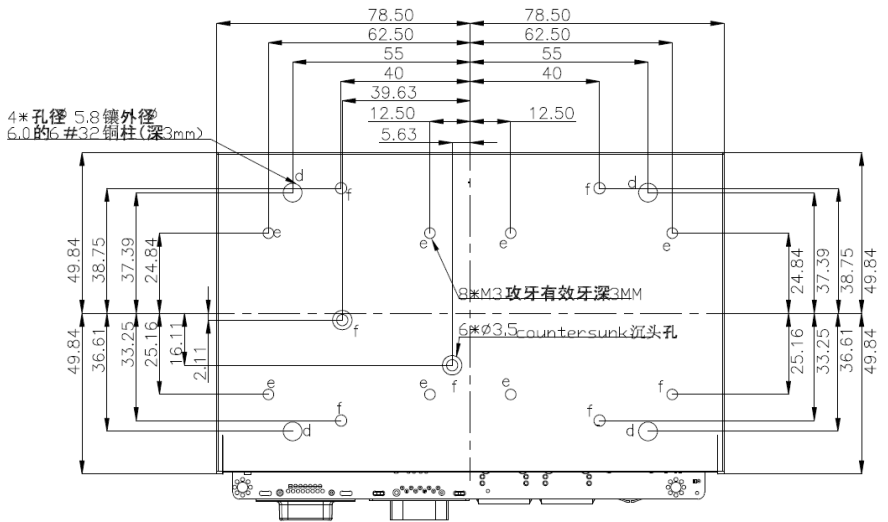
<b>VGA1: VGA connector</b>			
<b>PIN NO.</b>	<b>DESCRIPTION</b>	<b>PIN NO.</b>	<b>DESCRIPTION</b>
1	RED	2	GREEN
3	BLUE	4	NC
5	GND	6	GND
7	GND	8	GND
9	VCC	10	GND
11	NC	12	DDCDAT
13	HSYNC	14	VSYNC
15	DDCCLK		



# Board Layout: Jumper and Connector Locations



(Unit: mm)



(Unit: mm)