

IBT394E

(3.5 DiskSize SBC)
High-Temperature

Intel Atom X-Series
X5-E3940

(Heatsink, Bottom side)

USER DOCUMENTATION

Version 1.0
MAY 2024

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1. Models and Attentions

1.1 Models

This manual is applied to following models:

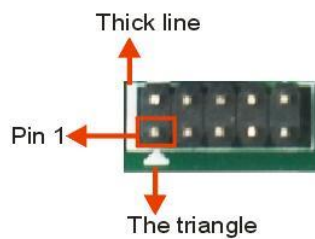
Model	CPU	COM	LAN	USB	M.2 Key-B	M.2 Key-E	LVDS/eDP	HDMI	SATA 3.0
IB394E	X5-E3940	6	2	9	5G/4G SATA SSD	WIFI+BT	LVDS	2	1

1.2 Attentions

1) Notes under a table or figure indicate the difference of models, or alternative definition of specific pin of the header (jumper/connector).

2) How to identify the first pin of a header or jumper

- Usually, there is a thick line or a triangle near the header's or jumper's pin 1.



- Square pad, which you can find on the back of the motherboard, is usually used for pin 1.



2. Specification

Model	IB394E	
CPU	CPU Model	Intel Atom® X-series X5-E3940
	Clock Speed	1.50GHz, up to 2.30GHz
	Multi-Core	Quad
	TDP	9.5 W
Display ^[1]	1 * LVDS/eDP (Header): LVDS up to 1920*1200@60Hz (default) or EDP up to 3840x2160@60Hz 2 * HDMI (upright 90° TYPE-A): max resolution up to 3840x2160@30Hz	
Memory	Support DDR3L 1333/1600/1866 MHz, 1 * SO-DIMM Slot, Up to 8GB	
Storage	1 * SATA3.0 7P Connector (with 1 * SATA Power Header) 1 * M.2 Key-B Slot (SATA SSD, 2242)	
Ethernet	LAN1: 1 * I210 GBE LAN Chip (RJ45, 10/100/1000 Mbps) LAN2: 1 * I210 GBE LAN Chip (RJ45, 10/100/1000 Mbps) (LAN2 colay with USB1 on the same position, default support LAN2)	
Audio	ES8336 Audio Codec 1 * Front Audio Header (Line-Out + MIC) 1 * Amplifier Header	
Expansion Slots	1 * M.2 (NGFF) Key-B Slot (5G/4G, 3052/3042, with 1 * SIM Card Header) ^[2] 1 * M.2 (NGFF) Key-E Slot (WIFI+BT, 2230)	
COM	1 * RS232/485 (COM1, Full lanes, DB9/M, RS232/485 SEL by Jumper, PIN1 DCD/5V/12V SEL by res, DCD default, PIN9 RI/5V SEL by res, RI default) 2 * RS232 (COM2/3, Full lanes, Header, PIN1 DCD/5V/12V SEL by res, DCD default, PIN9 RI/5V SEL by res, RI default) 1 * RS232 (COM4, 7 lanes, Header, PIN1 N/C /5V/12V SEL by res, N/C default, PIN9 N/C /5V SEL by res, N/C default) 1 * RS232 (COM5, 3 lanes, Header, only TX/RX/GND) 1 * RS232/485 (COM6, 3 lanes, Header, only TX/RX/GND)	
USB	4 * USB3.0 (TYPE-A, Rear IO) 2 * USB2.0 (Header or TYPE-A, F_USB4/5 colay with USB1, default F_USB4/5, Internal Header) 3 * USB2.0 (Header, Internal) ^[2]	
Other Ports	8 * GPIO 1 * Power LED Header 1 * Power Button Header 1 * System Reset Header 1 * HDD LED Header 1 * CMOS Clear Jumper	
System	Windows 10 64-bit, Linux 5.4/5.10/5.12	
Temperature	Storage: -20~75°C Operating: -40 ~ 85 °C (-40 ~ 185 °F)	
BIOS	AMI UEFI BIOS (Support Watchdog Timer)	
Power Supply	DC 12V 1 * DC 12V Power Input Header 1 * DC 12V Power Input Φ2.5mm Jack ^[3]	
Factor	146mm*105mm	

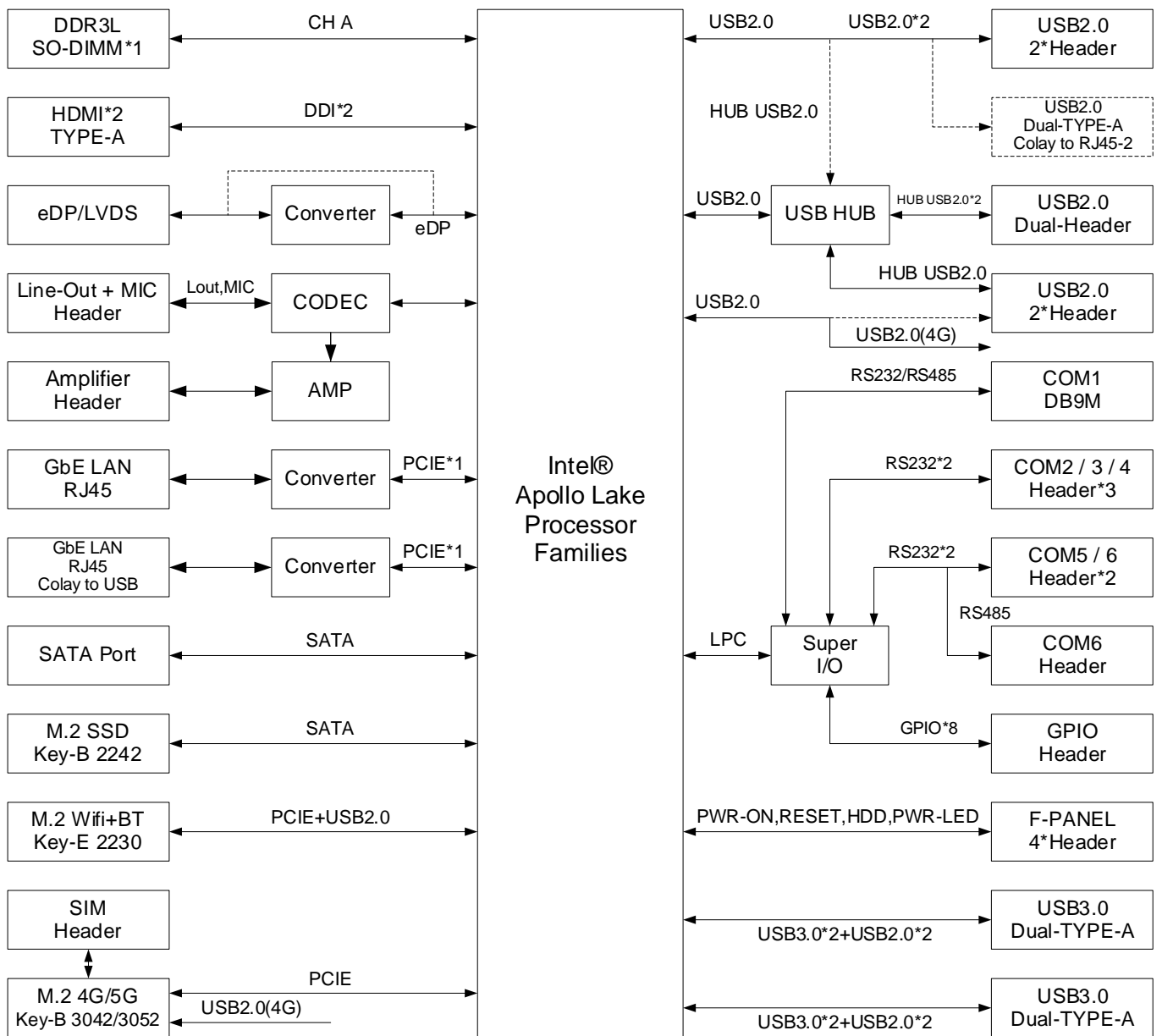
Notes:

[1]: Up to three independent displays can be activated at the same time.

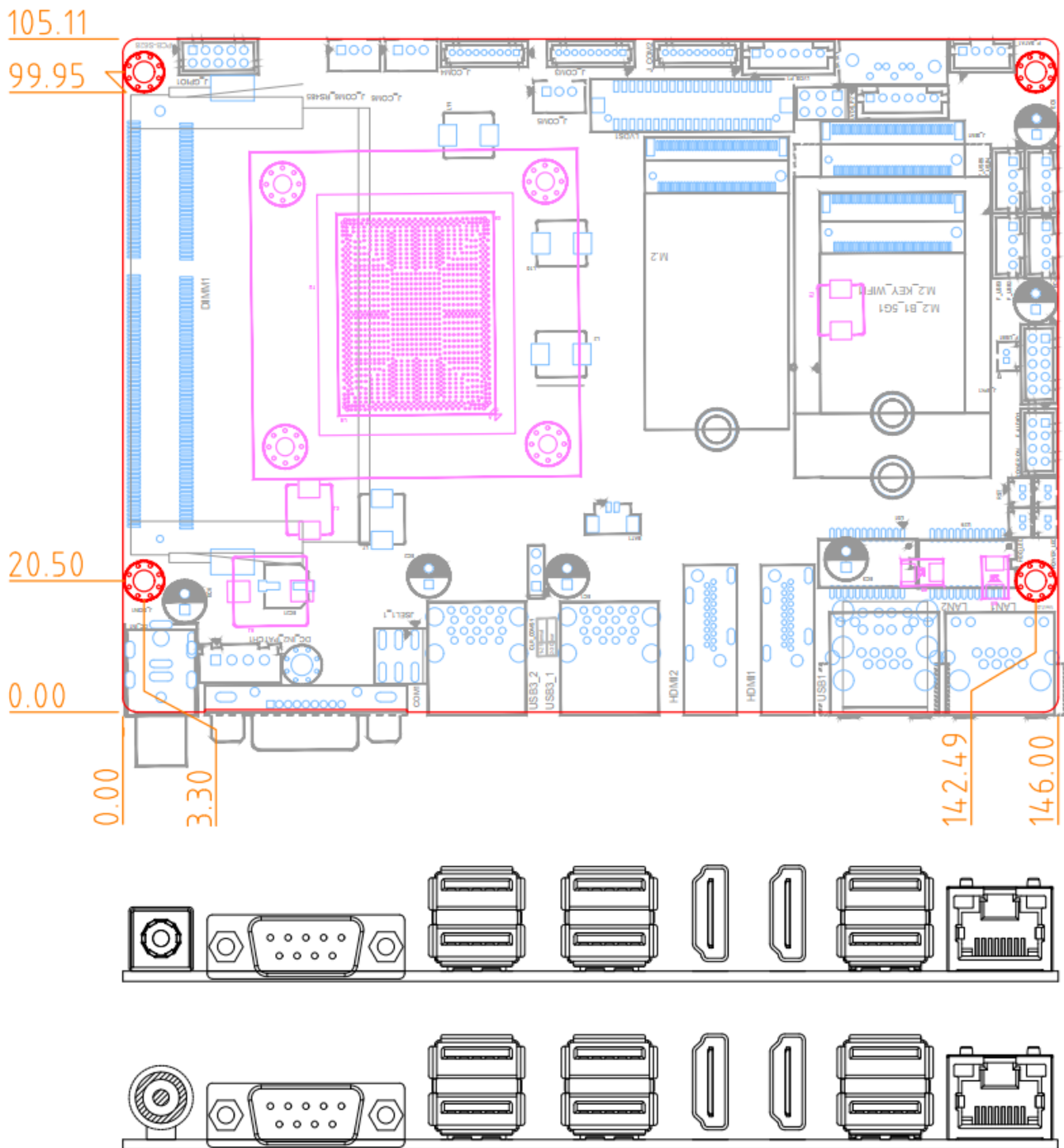
[2]: USB2_6 Signal of F_USB3 colay with M.2_B1_5G1, default support on M.2_B1_5G1. (resistor selectable)

[3]: DC 12V power input thread connector optional.

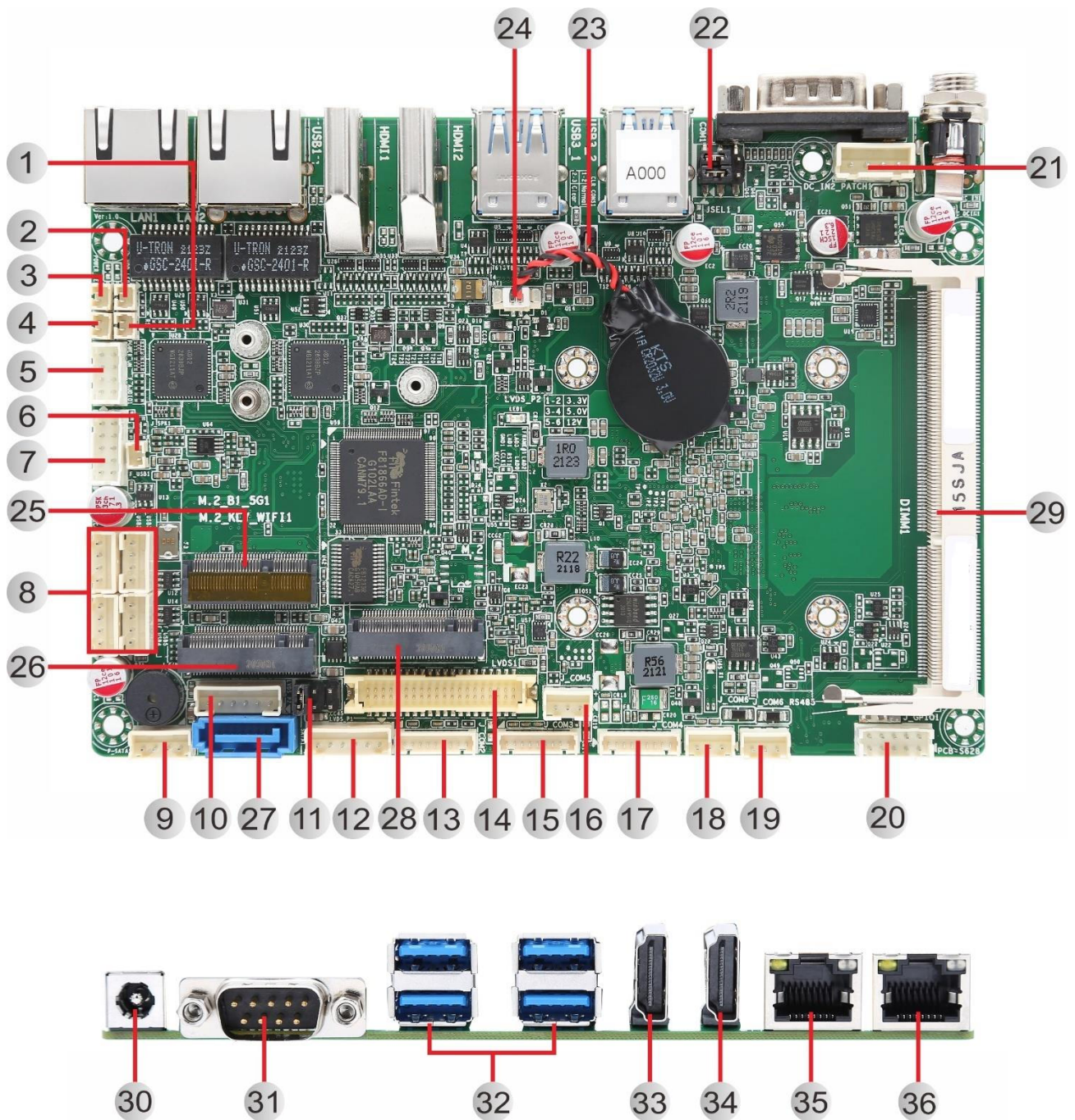
3.Functional Block Diagram

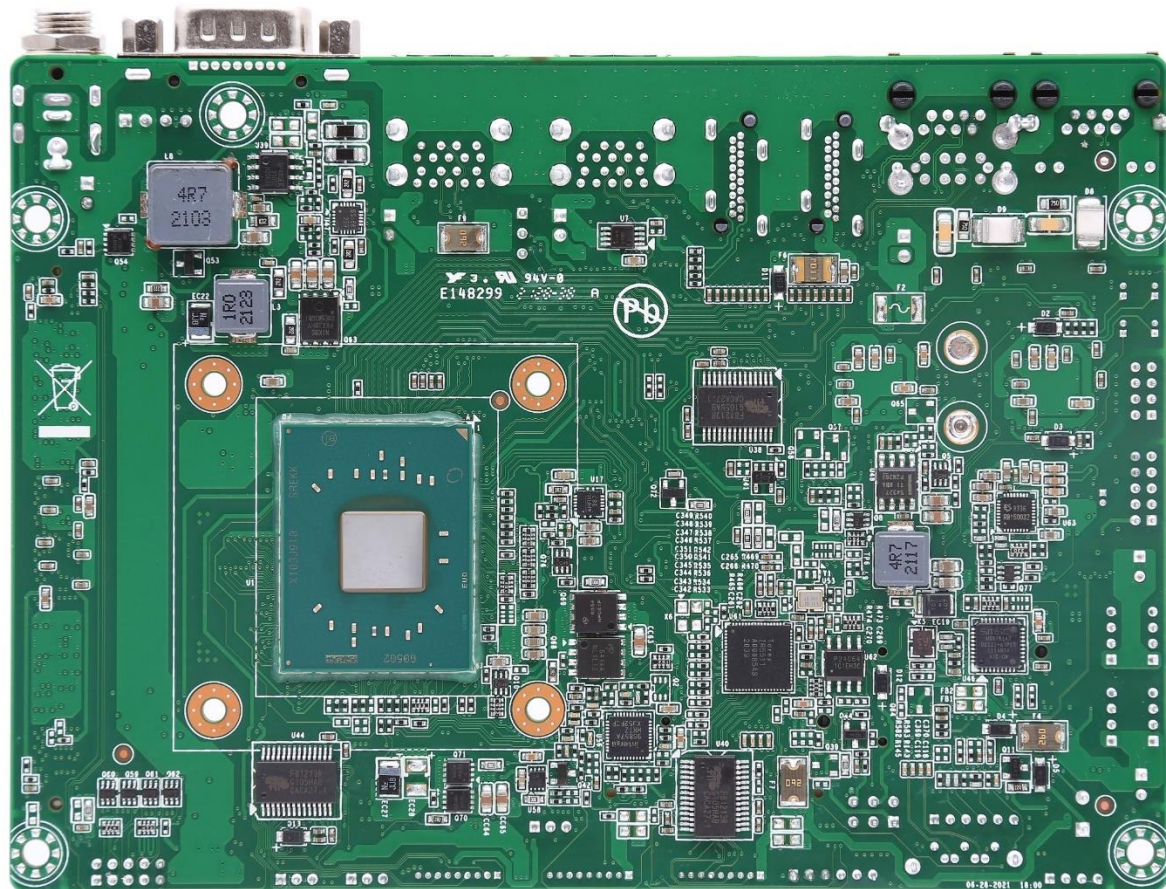


4. Mechanical Drawing



5. Jumpers / Headers and Connectors






Jumpers / Headers and Connectors

1	RST	System Reset Header
2	HDD_LED	HDD LED Header
3	POWER_LED	Power LED Header
4	POWER_ON	Power Button Header
5	F_AUDIO1	Front Audio Header (Line-Out + MIC)
6	J_SPK1	Amplifier Header
7	F_USB1	Front USB2.0 Header1
8	F_USB2/3/4/5	Front USB2.0 Header2/3/4/5
9	P_SATA1	SATA Power Header
10	J_SIM1	SIM Card Header
11	LVDS_P2	LVDS/eDP VDD Select Jumper
12	LVDS_P1	LVDS/eDP Backlight Control Header
13	J_COM2	COM2 Header
14	LVDS1	LVDS/eDP Signal Header
15	J_COM3	COM3 Header
16	J_COM5	COM5 Header


17	J_COM4	COM4 Header
18	J_COM6	COM6 Header
19	J_COM6_RS485	COM6 RS485 Header
20	J_GPIO1	GPIO Header
21	DC_IN2_PATCH1	DC 12V Power Input Header
22	JSEL1_1	COM1 RS232/485 Select Jumper
23	CLR_COMS1	CMOS Clear Jumper
24	BAT1	CMOS Battery Header
25	M.2_KEY_WIFI1	M.2 Key-E Slot (WIFI+BT, 2230)
26	M.2_B1_5G1	M.2 (NGFF) Key-B Slot (5G/4G, 3052/3042)
27	SATA1	SATA3.0 7P Connector
28	M.2	M.2 Key-B Slot (SATA SSD, 2242)
29	DIMM1	DDR3L SO-DIMM Slot
30	DC_IN1 (J_DCIN1)	DC 12V Power Input Φ 2.5mm Jack (DC 12V Power Input Thread Connector Optional)
31	COM1	COM1 DB9/M Connector
32	USB3_1/USB3_2	Dual USB3.0 TYPE-A Connector1/2
33	HDMI2	HDMI Upright TYPE-A Connector2
34	HDMI1	HDMI Upright TYPE-A Connector1
35	LAN2	GBE LAN RJ45 Connector2 (Dual USB2.0 TYPE-A Connector Optional)
36	LAN1	GBE LAN RJ45 Connector1

6. Definition of Jumpers /Headers and Connectors


1) RST (System Reset Header 2*1 Pin 1.25mm)

Graphic	Pin	Definition	Pin	Definition
	1	RESET+	2	RESET-


2) HDD_LED (HDD LED Header 2*1 Pin 1.25mm)

Graphic	Pin	Definition	Pin	Definition
	1	HD LED+	2	HD LED-

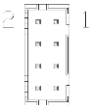
3) POWER_LED (Power LED Header 2*1 Pin 1.25mm)

Graphic	Pin	Definition	Pin	Definition
	1	Power LED+	2	Power LED-


4) POWER_ON (Power Button Header 2*1 Pin 1.25mm)

Graphic	Pin	Definition	Pin	Definition
	1	Power+	2	Power-

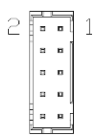
5) F_AUDIO1 (Front Audio Header 4*2 Pin 2.00mm)

Graphic	Pin	Definition	Pin	Definition
	2	MIC_IN_R	1	LINE_OUT_R
	4	GND	3	GND
	6	GND	5	GND
	8	MIC_IN_L	7	LINE_OUT_L





6) J_SPK1 (Amplifier Header 2*1 Pin 1.25mm)

Graphic	Pin	Definition	Pin	Definition
	1	SPK_OUT+	2	SPK_OUT-

7) F_USB1 (Front USB2.0 Header1 5*2 Pin 2.00mm)

Graphic	Pin	Definition	Pin	Definition
	2	+5V	1	+5V
	4	HUB_USB2_2-	3	HUB_USB2_3-
	6	HUB_USB2_2+	5	HUB_USB2_3+
	8	GND	7	GND
	10	N/C	9	GND

8) F_USB2/3/4/5 (Front USB2.0 Header2/3/4/5 4*1 Pin 2.00mm)


Graphic	Pin	Definition	Pin	Definition
 F_USB2	1	+ 5V	3	HUB_USB2_1+
	2	HUB_USB2_1-	4	GND
 F_USB3 [1]	1	+ 5V	3	USB2_6+
	2	USB2_6-	4	GND
 F_USB4 [2]	1	+ 5V	3	USB2_4+
	2	USB2_4-	4	GND
 F_USB5 [2]	1	+ 5V	3	HUB_USB2_4+
	2	HUB_USB2_4-	4	GND

Notes:


[1]: USB2_6 Signal of F_USB3 colay with M.2_B1_5G1, default support on M.2_B1_5G1. (resistor selectable)

[2]: USB Signal of F_USB4/5 colay with USB1, default support F_USB4/5. (resistor selectable)


9) P_SATA1 (SATA Power Header 4*1 Pin 2.00mm)

Graphic	Pin	Definition	Pin	Definition
	1	+ 12V	3	GND
	2	GND	4	+ 5V


10) J_SIM1 (SIM Card Header 6*1 Pin 2.00mm)

Graphic	Pin	Definition	Pin	Definition
	1	UIM_PWR	4	UIM_CLK
	2	GND	5	UIM_RST
	3	UIM_DAT	6	UIM_VPP


11) LVDS_P2 (LVDS/eDP VDD Select Jumper 3*2 Pin 2.54mm)

Graphic	Pin	Setting	Pin	Function
	1	1-2(Default)	2	+ 3.3V
	3	3-4	4	+ 5V
	5	5-6	6	+ 12V

12) LVDS_P1 (LVDS/eDP Backlight Control Header 6*1 Pin 2.00 mm)

Graphic	Pin	Definition	Pin	Definition
	1	GND	4	LVDS_BKLT_EN
	2	GND	5	+ 12V
	3	LVDS_BKLT_CTL	6	+ 12V

13) J_COM2 (COM2 Header 9*1 Pin 1.25mm)

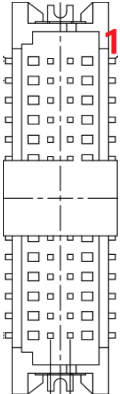
Graphic	Pin	Definition	Pin	Definition
	1	COM2_DCD ^[1]	6	COM2_CTS
	2	COM2_DSR	7	COM2_DTR
	3	COM2_RXD	8	COM2_RI ^[2]
	4	COM2_RTS	9	GND
	5	COM2_TXD		

Notes:

[1]: DCD Pin of J_COM2 is DCD by default, 5V/12V is available if specified. (resistor selectable)

[2]: RI Pin of J_COM2 is RI by default, 5V is available if specified. (resistor selectable)

14) LVDS1(LVDS/eDP Signal Header 20*2 Pin 1.25mm)


Graphic	Pin	Definition	Pin	Definition
	2	VDD_PANEL [1]	1	VDD_PANEL [1]
	4	GND	3	LVDS_PRSENT#/ N/C [2]
	6	VDD_PANEL [1]	5	VDD_PANEL [1]
	8	LVDS_B_DATA0-/ EDP_TX0- [2]	7	LVDS_A_DATA0-/ N/C [2]
	10	LVDS_B_DATA0+/ EDP_TX0+ [2]	9	LVDS_A_DATA0+/ N/C [2]
	12	GND	11	GND
	14	LVDS_B_DATA1-/ EDP_TX1- [2]	13	LVDS_A_DATA1-/ N/C [2]
	16	LVDS_B_DATA1+/ EDP_TX1+ [2]	15	LVDS_A_DATA1+/ N/C [2]
	18	GND	17	GND
	20	LVDS_B_DATA2-/ EDP_TX2- [2]	19	LVDS_A_DATA2-/ N/C [2]
	22	LVDS_B_DATA2+/ EDP_TX2+ [2]	21	LVDS_A_DATA2+/ N/C [2]
	24	GND	23	GND
	26	LVDS_B_CLK-/ EDP_TX3- [2]	25	LVDS_A_CLK-/ N/C [2]
	28	LVDS_B_CLK+/ EDP_TX3+ [2]	27	LVDS_A_CLK+/ N/C [2]
	30	GND	29	GND
	32	N/C / EDP_HPD# [2]	31	N/C
	34	GND	33	GND
	36	LVDS_B_DATA3-/ EDP_AUX- [2]	35	LVDS_A_DATA3-/ N/C [2]
	38	LVDS_B_DATA3+/ EDP_AUX+ [2]	37	LVDS_A_DATA3+/ N/C [2]
	40	GND	39	N/C

Notes:

[1]: Panel Power VDD is 3.3V by default, 5V/12V is selectable by "LVDS/eDP VDD Select Jumper" (LVDS_P2, Table10).

[2]: It supports LVDS by default and can supports EDP if specified. (resistor selectable)

15) J_COM3 (COM3 Header 9*1 Pin 1.25mm)


Graphic	Pin	Definition	Pin	Definition
	1	COM3_DCD ^[1]	6	COM3_CTS
	2	COM3_DSR	7	COM3_DTR
	3	COM3_RXD	8	COM3_RI ^[2]
	4	COM3_RTS	9	GND
	5	COM3_TXD		

Notes:

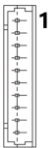
[1]: DCD Pin of J_COM3 is DCD by default, 5V/12V is available if specified. (resistor selectable)

[2]: RI Pin of J_COM3 is RI by default, 5V is available if specified. (resistor selectable)

16) J_COM5 (COM5 Header 3*1 Pin 2.00mm)

Graphic	Pin	Definition	Pin	Definition
	1	COM5_RXD	3	GND
	2	COM5_TXD		

17) J_COM4 (COM4 Header 9*1 Pin 1.25mm)


Graphic	Pin	Definition	Pin	Definition
	1	COM4_DB9_PIN1 ^[1]	6	COM4_CTS
	2	COM4_DSR	7	COM4_DTR
	3	COM4_RXD	8	COM4_DB9_PIN9 ^[2]
	4	COM4_RTS	9	GND
	5	COM4_TXD		

Notes:


[1]: COM4_DB9_PIN1 is N/C by default, 5V/12V is available if specified. (resistor selectable)

[2]: COM4_DB9_PIN9 is N/C by default, 5V is available if specified. (resistor selectable)

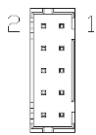
18) J_COM6 (COM6 Header 3*1 Pin 2.00mm)

Graphic	Pin	Definition	Pin	Definition
	1	COM6_RXD	3	GND
	2	COM6_TXD		

19) J_COM6_RS485 (COM6 RS485 Header 3*1 Pin 2.00 mm)

Graphic	Pin	Definition	Pin	Definition
	1	COM6_RS485+	3	GND
	2	COM6_RS485-		

20) J_GPIO1 (GPIO Header 5*2 Pin 2.00mm)


Graphic	Pin	Definition	Pin	Definition
	2	SIO_GPI70 (0xA02 Bit0, H ^[1])	1	SIO_GPI71 (0xA02 Bit1, H)
	4	SIO_GPI72 (0xA02 Bit2, H)	3	SIO_GPI73 (0xA02 Bit3, H)
	6	SIO_GPO74 (0xA02 Bit4, H)	5	SIO_GPO75 (0xA02 Bit5, H)
	8	SIO_GPO76 (0xA02 Bit6, H)	7	SIO_GPO77 (0xA02 Bit7, H)
	10	+ 3.3V ^[2]	9	GND

Notes:


[1]: "H" or "L" means the default voltage is High or Low level.

[2]: Power on this Pin is 3.3V by default, 5V is available if specified. (resistor selectable)

21) DC_IN2_PATCH1 (DC 12V Power Input Header 4*1 Pin 2.54mm)

Graphic	Pin	Definition	Pin	Definition
	1	+ 12V_IN	3	GND
	2	+ 12V_IN	4	GND


22) JSEL1_1 (COM1 RS232/485 Select Jumper 3*2 Pin 2.54 mm)

Graphic	Setting	Function
	1-3, 2-4(Default)	COM1_PIN1: DCD/5V/12V ^[1] COM1_PIN2: RXD
	3-5, 4-6	COM1_PIN1: RS485 - COM1_PIN2: RS485 +


Notes:

[1]: COM1_PIN1 is DCD by default, 5V/12V is available if specified. (resistor selectable)

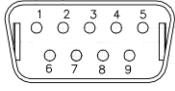
23) CLR_CMOS1 (CMOS Clear Jumper 3*1 Pin 2.54mm)

Graphic	Setting	Function
	1-2 (Default)	Normal
	2-3	Clear CMOS

24) BAT1 (CMOS Battery Header 2*1 Pin 1.25mm)

Graphic	Pin	Definition	Pin	Definition
	1	VBAT	2	GND

31) COM1 (COM1 DB9/M Connector)

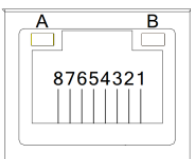
Graphic	Pin	Definition	Pin	Definition
	1	COM1_PIN1 [1]	6	COM1_DSR
	2	COM1_PIN2 [1]	7	COM1_RTS
	3	COM1_TXD	8	COM1_CTS
	4	COM1_DTR	9	COM1_PIN9 [2]
	5	GND		

Notes:

[1]: COM1 can be RS232 / RS485 by selecting JSEL1_1 Jumper, check Table22 for detail. When COM1 support RS232, Pin1 of COM1 is DCD by default, 5V/12V is available if specified. (resistor selectable)

[2]: Pin9 of COM1 is RI by default, 5V is available if specified. (resistor selectable)

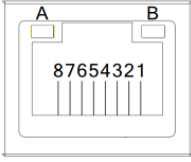
35) LAN2 (LAN RJ45 Connector 8Pin) [1]

Graphic	Pin	Definition	Pin	Definition
	1	MDI0_1+	5	MDI2_1-
	2	MDI0_1-	6	MDI1_1-
	3	MDI1_1+	7	MDI3_1+
	4	MDI2_1+	8	MDI3_1-
	A	Active LED	ACT: Twinkling Yellow Only LINK: Lights On Stop: Lights Off	B

Notes:

[1]: LAN2 colay with USB1 (default LAN2).

36) LAN1 (LAN RJ45 Connector 8Pin)

Graphic	Pin	Definition	Pin	Definition
	1	MDI0_1+	5	MDI2_1-
	2	MDI0_1-	6	MDI1_1-
	3	MDI1_1+	7	MDI3_1+
	4	MDI2_1+	8	MDI3_1-
	A	Active LED	ACT: Twinkling Yellow Only LINK: Lights On Stop: Lights Off	B
				1000M: Turn Yellow 100M: Turn Green 10M: Lights Off

7. BIOS setup

See "BIOS Spec for Intel Atom® X-series" for detail information of BIOS setup.

【End】