



IAC-A5D3x-Kit Hardware Manual

Version:1.0

2013. 12

Version Updates

Version	Hardware Platform	Description	Date	Revisor
1.0	IAC-A5D3x-Kit	Launched	2013-12-20	ST



Catalogue

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This manual is used for introducing the hardware interfaces on the development board.

Preface

1. 1. Company Profile:

Hangzhou Qiyang Technology Co., Ltd. is located at the bank of the beautiful West Lake. It is a high and new technology enterprise which is specializing in R&D, manufacture and sell embedded computer main board with high performance, low power consumption, low cost, small volume, and provides embedded hardware solutions.

We Offer:

◆ Research & develop, manufacture and sell embedded module products which have independent intellectual property rights, and cooperate with TI, ATMEL, Cirrus Logic, Freescale, and other famous processor manufacturers. It has launched a series of hardware products, such as ARM development board, ARM core module, ARM industrial board, sound/video decoding transmission platform, supporting tools and software resources which support user for their next embedded design.

◆ We give full play to the technical accumulation in ARM platform and Windows CE, Linux, Android operating system for many users providing custom service (OEM/ODM), to realize embedded products into the market stably, reliably and quickly.

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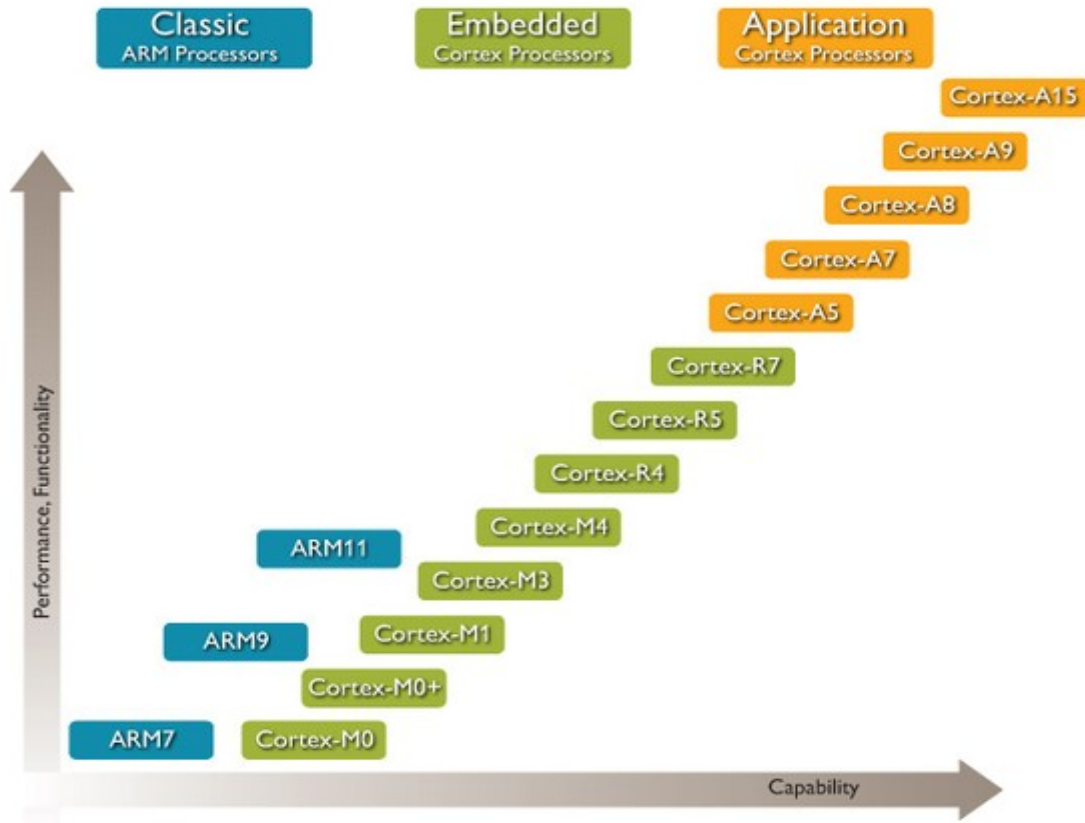
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1.2. Suggestion for using IAC-A5D3x-Kit development board.

1. Please read the instructions first, before using the development board;
2. Before using, please check the packing list and see whether there is a missing file in the CD;
3. Please understand the basic structure and composition of the development board, including the hardware resource allocation, each pin definition of core board and back plane etc.;
4. If you need to develop on Linux system and burn program into the development board, in addition to this document, we also suggest reading another document *IAC-A5D3x-Kit Linux User Manual*;

II .System Composition

2. 1. ARM Kernel Performance Comparison

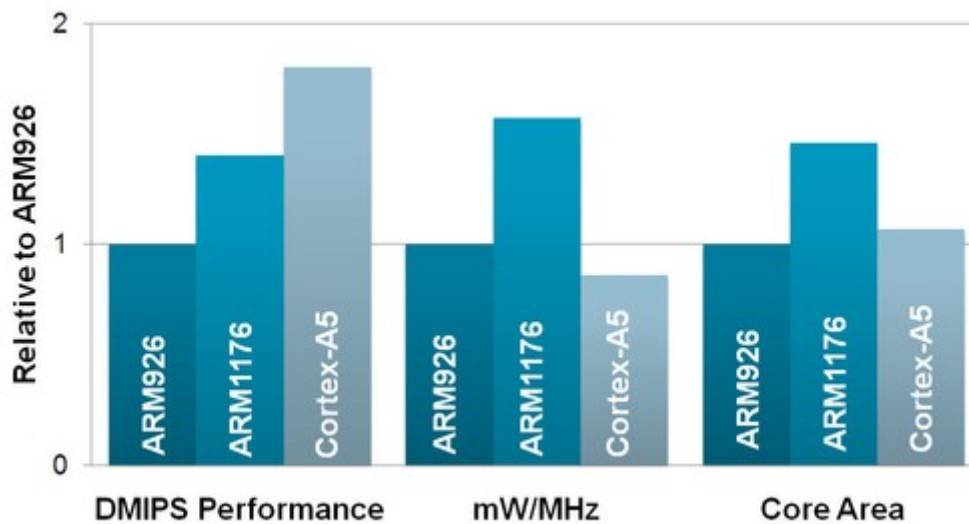


Kernel	ARM9	ARM11	Cortex A5	Cortex A8	Cortex A9
Architecture(RISC)	ARMv5TE	ARMv6	ARMv7	ARMv7	ARMv7
Prediction	200-470 MHz	400-1000 MHz	300-800 MHz	600-1000 MHz	600-1000 MHz
DMIPS/MHz	1.1	1.25	1.57	2.0	2.5

The Cortex-A5 processor provides a high-value migration path for existing ARM926EJ-S™ and ARM1176JZ-S™ processor designs. It achieves better than ARM1176JZ-S performance, better power and energy efficiency than the ARM926EJ-S, and 100% Cortex-A compatibility.

These processors deliver high end features to power and cost sensitive applications, featuring:

- ◆ Multiprocessing capability for scalable, energy efficient performance
- ◆ Optional floating point or NEON™ units for media and signal processing
- ◆ Full application compatibility with the Cortex-A8, Cortex-A9, and Classic ARM processors
- ◆ High performance memory system including caches and memory management unit



Cortex A5&ARM9/ARM11

2.2. SAM5D3 Processor Series Function

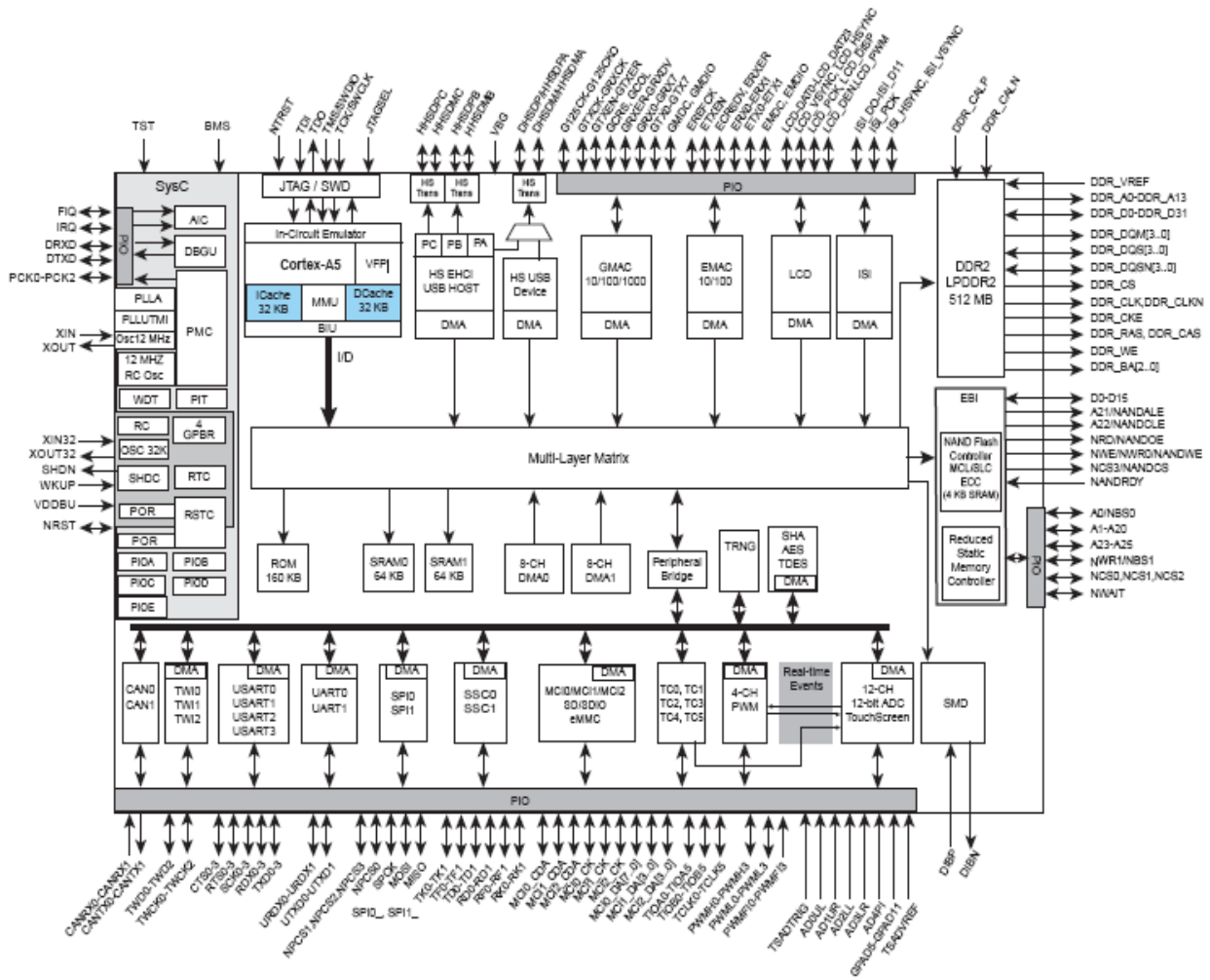
IAC-A5D3x-Kit adopts ATMEL SAMA5D3X series chips and Cortex A5 kernel. Standard configuration is SAMA5D34 development board. For batch order users, we can adopt different chips to lower cost. Please see the following detailed version

difference:

	SAMA5D31	SAMA5D33	SAMA5D34	SAMA5D35
LCDC	•	•	•	
GMAC		•	•	•
EMAC	•			•
CAN0, CAN1			•	•
HSMCI2	•		•	•
UART0	•			•
UART1	•			•
TC1				•

IAC-A5D3x-Kit is the ARM Cortex-A5 series of ARM v7-A Thumb2 instruction set computing (RISC) microprocessor released by ATMEL. 32 KB data cache, 32 KB instruction cache, the virtual memory system architecture(VMSA), fully integrated MMU and Floating-point Unit(VFPv4), also SAMA5D3X with extremely abundant interface resource.

Device Connection Pictorial View:



- ◆ ARM Cortex-A5,536MHZ;
- ◆ 24-bit LCD controller and touch panel controller, resolution up to 2048*2048;
- ◆ 2-ch USB2.0 OTG integrated PHY;
- ◆ Support Max. 6-ch UART;
- ◆ 2-ch industrial Ethernet MAC(10/100MHZ);
- ◆ 2-ch CAN ports, support CAN2.0 A protocol and B protocol;
- ◆ 2-ch multifunction audio channel;

◆Common peripheral: Multi-channel SPI、I2C、ISI、JTAG、timer.

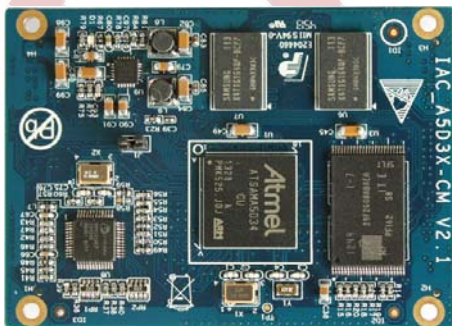
2.3. Onboard Resource

Hardware Resource	CPU	ATMEL SAMA5D34 CPU, ARM Cortex A5 Kernel,536MHZ
	RAM	DDR2 SDRAM, total 256MB
	Flash	256MB NandFlash, 2MB DataFlash
	Network	DM9162 Network Chip, adopt MII mode,support 10M/100Mperfectly
	Communication Interface	5-ch RS232 UART, include: 1-ch port is as the debug UART, 2-ch RS232 Multiplex with RS485
		3-ch USB2.0, include:1-ch USB2.0 Device,2-ch USB2.0 HOST
		1-ch CAN, support CAN2.0 protocol
		2-ch 10/100Mbps Ethernet port, with ACT/LINK indicator
	Display	PWM;SPI;I2C
		18-bit TFT-LCD(Compatible with 24 bits), resolution up to 2048 x 2048 VGA interface, can be connected with universal display
	Audio	Binaural audio output; MIC audio input
	Input Interface	8 * 8 matrix keyboard, and can be used as I/O.
		4-wire resistive touch panel; AD input interface
	Expansion Interface	EBI bus interface
USB_WIFI interface		
Memory Interface	1-ch SD Card interface	
Other Device	Reset circuit, real-time clock, buzzer, JTAG interface	
Power Input	+12V power supply, can support +6V~+23V wide range	
Provided Materials	Development Tool	Development Environment: Virtual Machine:VM9.0.2+ubuntu12.04.1
		Application layer developing debugging tool
		Cross compiler
		Common terminal development debugging tool
	System Image	The corresponding operation system image file supports various resolution display.
	Test Program	Interface apply for demo test program and test program source code.
	Source Code	Bootloader, kernel,file system source code
Manual	Mainboard guide manual, device manual	

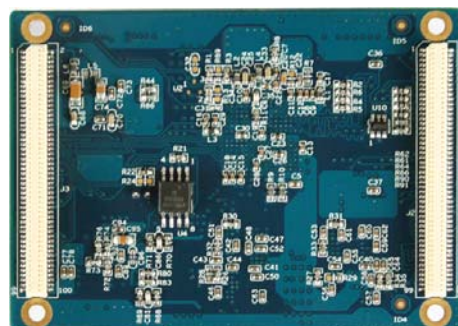
	Mechanical Chart	Mainboard structure and size chart
Electricity Character	Size	Core Board: 74mm*53mm;Back Plane:160mm*110mm
	Layer	Core Bord:8-layer high precision immersion gold process; Back Plane:4-layer high precision immersion gold process
	Power Consumption	Core Board<1W;Whole Board≤2W
	Operation Temperature	-20℃ ~ +70℃ (Can be customized to the industrial range -40℃ ~ +85℃)
	Working Humidity	5%-95%, Non-Condensing

2.4 Core Board Resource

IAC-A5D3X-CM core board has high precision of 8-layer PCB board with the best electric performance and anti-interference performance; hardware resources: integration of CPU, NorFlash, RAM, network chip, as many as 200pins. It fully expands the SAMA5D3X hardware resources and the user can make combination of different interface functions by reusing pin, also can clip hardware by yourself, and make the most suitable back plane.



Front Side



Back Side

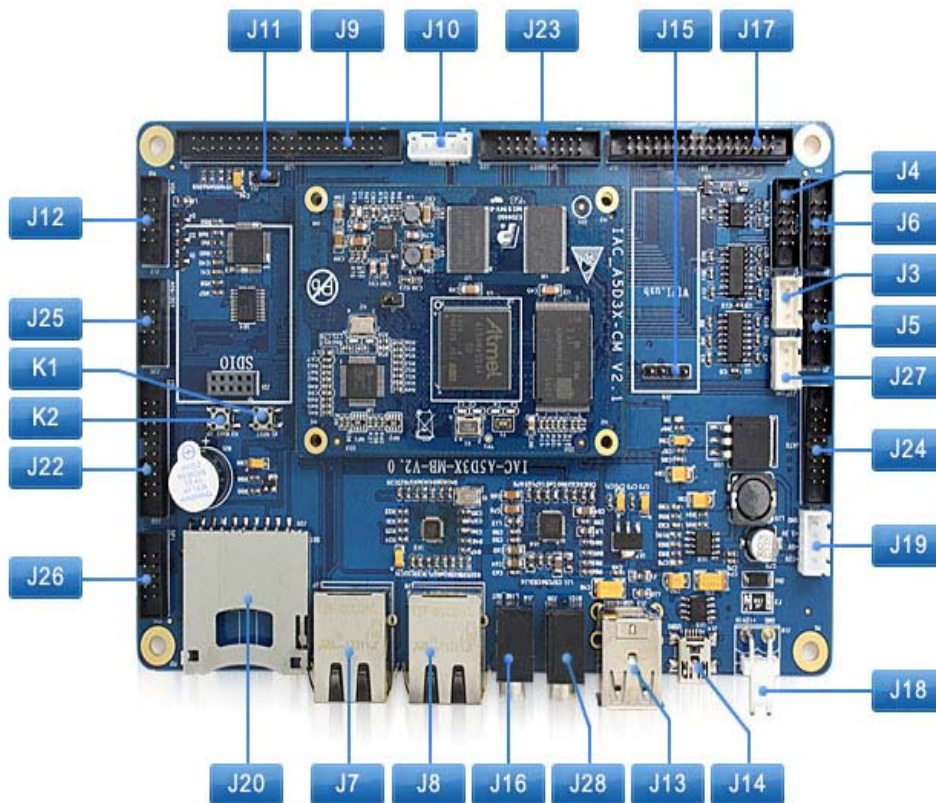
- ◆ ATMEL SAMA5D34 CPU,536MHz;
- ◆ 256M DDR2 SDRAM,256MB NandFlash,2MB DataFlash;
- ◆ DM9162 network chip, support 10M/100M adaptable Ethernet with MII mode;
- ◆ IAC-A5D3X-CM Core board adopts high precision of 8-layer PCB board with the best electric performance and anti-interference performance;
- ◆ Size: 74mm*53mm, only a size of a business card, suitable for various embedded applications;
- ◆ Core board of the short sides are using 2 pieces of 2 * 50 B to B connector, which is convenient for hardware clipping and multiple platforms using.
- ◆ Power Supply: 5V, adopt TI's MPU management chip, output voltages required by core board, low power consumption, power consumption is lower than 1W.
- ◆ Provide reset circuit and wake-up function.

2.5. Back Plane Resource

Qiyang expands the standard IAC-A5D3x-MB back plane, using high precision 4-layer PCB with the best electric performance and anti-interference ability. Also it fully expands different kinds of interface resources supported by SAMA5D3X, which users can customize it base on your own needs.

III. Interface Illustration:

3.1. Block Diagram:



3.2. Basic Interface Function Description:

Label	Function
J3	Debug UART
J4	UART 1&RS485_1

J5	UART 0&UART 3
J6	UART 2&RS48_2
J7	Ethernet interface 0
J8	Ethernet interface 1
J9	LCD interface
J10	I2C capacitive interface
J11	LCD power supply selection
J12	VGA interface
J13	2-USB Host interface
J14	USB Device interfaece
J15	Reserved USB WIFI interface multiplexes USB Device
J16	Audio output interface
J17	EBI Bus Interface
J18	12V power input interface
J19	Reserved multi voltage source output interface
J20	SD Card
J21	SDIO interface
J22	ISI interface
J23	8x8 matrix keyboard interface
J24	JTAG debugging interface
J25	ADC&I2C1 interface
J26	SPI interface
J27	CAN interface
J28	MIC audio input interface
K1	Reset button
K2	Reset button

3.3 Pin Definition:

J1:

Signal Name	PIN	PIN	Signal Name
GND	1	2	GND
GND	3	4	GND
USB0_DP	5	6	PIO_D31
USB0_DM	7	8	NC
PIO_D30	9	10	PIO_D29
USB1_DP	11	12	PIO_D28
USB1_DM	13	14	NC
JTAG_NTRST	15	16	JTAG_TCK
JTAG_TDI	17	18	JTAGSEL
JTAG_TMS	19	20	JTAG_TDO
CAN0_RX	21	22	PIO_D16
CAN0_TX	23	24	PIO_B18
PIO_C29	25	26	PIO_B25
PIO_C30	27	28	PIO_E16
EBI_A0	29	30	PIO_E17
EBI_A1	31	32	PIO_E29
I2C1_SDA	33	34	I2C1_SCL
SSC0_TF	35	36	SSC0_RF
NC	37	38	USB2_DP
NC	39	40	USB2_DM
PIO_E20	41	42	GND

DEBUG_RXD	43	44	DEBUG_TXD
UART0_RXD	45	46	UART0_TXD
UART1_RXD	47	48	UART1_TXD
UART1_CTS	49	50	UART1_RTS
UART2_RXD	51	52	UART2_TXD
UART2_CTS	53	54	UART2_RTS
UART3_RXD	55	56	UART3_TXD
GND	57	58	MCI0_D4
MCI0_D5	59	60	PWMH3
PWML3	61	62	PIO_E11
PIO_E10	63	64	PIO_E13
PIO_E12	65	66	PIO_E15
PIO_E14	67	68	GND
FIQ	69	70	EBI_IRQ
EBI_NCS1	71	72	EBI_NCS2
EBI_NRD	73	74	EBI_NWE
EBI_NWAIT	75	76	EBI_A2
EBI_A3	77	78	EBI_A4
EBI_A5	79	80	EBI_A6
EBI_A7	81	82	EBI_A8
EBI_A9	83	84	EBI_D0
EBI_D1	85	86	EBI_D2
EBI_D3	87	88	EBI_D4
EBI_D5	89	90	EBI_D6
EBI_D7	91	92	EBI_D8
EBI_D9	93	94	EBI_D10

EBI_D11	95	96	EBI_D12
EBI_D13	97	98	EBI_D14
EBI_D15	99	100	GND

J2:

Signal Name	PIN	PIN	Signal Name
GND	1	2	AVDDT
TPRX-	3	4	TPTX-
TPRX+	5	6	TPTX+
LED_LNK	7	8	LED_ACT
SPI1_NCS3	9	10	GND
SPI1_NCS0	11	12	SPI1_SCLK
SPI1_MISO	13	14	SPI1_MOSI
MCI1_CMD	15	16	MCI1_CLK
MCI1_D0	17	18	MCI1_D1
MCI1_D2	19	20	MCI1_D3
SSC0_RD	21	22	SSC0_RK
I2C0_SDA	23	24	I2C0_SCL
MCI0_CMD	25	26	MCI0_CLK
MCI0_D0	27	28	MCI0_D1
MCI0_D2	29	30	MCI0_D3
SSC0_TD	31	32	SSC0_TK
GND	33	34	LCD_D7
LCD_D6	35	36	LCD_D5
LCD_D4	37	38	LCD_D3
LCD_D2	39	40	LCD_D1
LCD_D0	41	42	LCD_D15

LCD_D14	43	44	LCD_D13
LCD_D12	45	46	LCD_D11
LCD_D10	47	48	LCD_D9
LCD_D8	49	50	LCD_D23
LCD_D22	51	52	LCD_D21
LCD_D20	53	54	LCD_D19
LCD_D18	55	56	LCD_D17
LCD_D16	57	58	LCD_DE
LCD_PCLK	59	60	LCD_HS
LCD_VS	61	62	LCD_PWM
NC	63	64	LCD_DISP
GND	65	66	GND
ADC_D0	67	68	ADC_D2
ADC_D1	69	70	ADC_D3
ADC_D4	71	72	ADC_D6
ADC_D5	73	74	ADC_D7
GND	75	76	VDDBU
ETXD0	77	78	EMDC
ETXD1	79	80	EMDIO
ERXD0	81	82	PIO_C10
ERXD1	83	84	PIO_C11
ETXEN	85	86	PIO_C12
ECRSDV	87	88	PIO_C13
ERXER	89	90	PIO_C14
EREFCLK	91	92	PIO_C15
SYS_RSTN	93	94	WKUP

SHDN	95	96	ADTRG
+5.0VD	97	98	+5.0VD
+5.0VD	99	100	+5.0VD

J3: Debugging UART

PIN	Signal Name
1	J_DTXD
2	J_DRXD
3	GND

J4: UART 1&RS485_1

Signal Name	PIN	PIN	Signal Name
J_TXD1	1	2	J_RXD1
GND	3	4	GND
J_CTS1	5	6	J_RTS1
GND	7	8	GND
J_485A1	9	10	J_485B1

J5: UART 3&UART 0

Signal Name	PIN	PIN	Signal Name
J_TXD3	1	2	J_RXD3
GND	3	4	GND
NC	5	6	NC
GND	7	8	GND
J_TXD0	9	10	J_RXD0

J6: UART 2&RS485_2

Signal Name	PIN	PIN	Signal Name
J_TXD2	1	2	J_RXD2
GND	3	4	GND
J_CTS2	5	6	J_RTS2
GND	7	8	GND
J_485A2	9	10	J_485B2

J9: LCD Interface

Signal Name	PIN	PIN	Signal Name
GND	1	2	LCD_PCLK
LCD_HS	3	4	LCD_VS
GND	5	6	LCD_D12
LCD_D13	7	8	LCD_D14
LCD_D15	9	10	LCD_D16
LCD_D17	11	12	GND
LCD_D6	13	14	LCD_D7
LCD_D8	15	16	LCD_D9
LCD_D10	17	18	LCD_D11
GND	19	20	LCD_D0
LCD_D1	21	22	LCD_D2
LCD_D3	23	24	LCD_D4
LCD_D5	25	26	GND
LCD_DE	27	28	LCD_VDD
LCD_VDD	29	30	LCD_DISP
LCD_MOD	31	32	LCD_D20

LCD_PWM	33	34	NC
GND	35	36	NC
NC	37	38	NC
NC	39	40	NC
ADC_D0	41	42	ADC_D2
ADC_D1	43	44	ADC_D3

J10: I2C Capacitive Touch Panel Interface

PIN	Signal Name
1	GND
2	PIO_C14
3	PIO_C15
4	I2C0_SCL
5	I2C0_SDA
6	+3.3VD

J11: LCD Power Supply Jumper Selection

Connect PIN1 and PIN 2: 3.3V power supply

Connect PIN2 and PIN3:5.0V power supply

Select the voltage according to the actual LCD screen or driver board

PIN	Signal Name
1	+3.3VD
2	LCD_VDD
3	+5.0VD

J12: VGA

Signal Name	PIN	PIN	Signal Name
RED	1	2	GREEN
BLUE	3	4	HSYNC_VGA
GND_VGA	5	6	VSYNC_VGA
GND_VGA	7	8	GND_VGA
GND_VGA	9	10	GND_VGA

J15: USB_WIFI Reserved Interface

PIN	Signal Name
1	+3.3VD/+5.0VD
2	USB0_DM
3	USB0_DP
4	GND

J17: EBI

Signal Name	PIN	PIN	Signal Name
+3.3VD	1	2	+3.3VD
EBI_IRQ	3	4	EBI_NCS1
EBI_NCS2	5	6	EBI_NRD
EBI_NWE	7	8	EBI_NWAIT
EBI_A0	9	10	EBI_A1
EBI_A2	11	12	EBI_A3
EBI_A4	13	14	EBI_A5
EBI_A6	15	16	EBI_A7
EBI_D0	17	18	EBI_D1

EBI_D2	19	20	EBI_D3
EBI_D4	21	22	EBI_D5
EBI_D6	23	24	EBI_D7
EBI_D8	25	26	EBI_D9
EBI_D10	27	28	EBI_D11
EBI_D12	29	30	EBI_D13
EBI_D14	31	32	EBI_D15
GND	33	34	GND

J19: Reserved multi voltage source output interface

PIN	Signal Name
1	+12VD
2	+5.0VD
3	+3.3VD
4	GND

J21:SDIO Interface

Signal Name	PIN	PIN	Signal Name
+3.3VD	1	2	GND
SYS_RSTN	3	4	MCI1_D0
MCI1_D3	5	6	MCI1_CMD
MCI1_D2	7	8	MCI1_CLK
MCI1_D1	9	10	NC

J22: ISI Interface

Signal Name	PIN	PIN	Signal Name
+3.3VD	1	2	GND
I2C1——SCL (ISI_D10)	3	4	I2C1_SDA (ISI_D11)
I2C0_SDA (ISI_VSYNC)	5	6	I2C0_SCL (ISI_HSYNC)
PIO_C30 (ISI_PCK)	7	8	PIO_D31 (MAIN_CLK)
SPI1_NCS3 (ISI_D9)	9	10	PIO_C29 (ISI_D8)
LCD_D23 (ISI_D7)	11	12	LCD_D22 (ISI_D6)
LCD_D21 (ISI_D5)	13	14	LCD_D20 (ISI_D4)
LCD_D19 (ISI_D3)	15	16	LCD_D18 (ISI_D2)
ISI_RST	17	18	ISI_PWND
LCD_D17 (ISI_D1)	19	20	LCD_D16 (ISI_D0)

J23:GPIO&Keyboard Interface

Signal Name	PIN	PIN	Signal Name
+3.3VD	1	2	GND
EBI_A8	3	4	EBI_A9
PIO_E14	5	6	PIO_E15
PIO_E12	7	8	PIO_E13
PIO_E10	9	10	PIO_E11
PIO_E29	11	12	PIO_E17
PIO_E16	13	14	PIO_B25
PIO_B18	15	16	PIO_D16
PIO_C10	17	18	PIO_C11
GND	19	20	GND

J24: JTAG Interface

Signal Name	PIN	PIN	Signal Name
+3.3VD	1	2	+3.3VD
GND	3	4	JTAG_NTRST
GND	5	6	JTAG_TDI
GND	7	8	JTAG_TMS
GND	9	10	JTAG_TCK
GND	11	12	JTAGSEL
GND	13	14	JTAG_TDO
GND	15	16	SYS_RSTN

J25: AD&I2C Interface

Signal Name	PIN	PIN	Signal Name
+3.3VD	1	2	+3.3VD
ADTRG	3	4	ADC_D4
ADC_D5	5	6	ADC_D6
ADC_D7	7	8	I2C1_SDA
I2C1_SCL	9	10	GND

J26: SPI Interface

Signal Name	PIN	PIN	Signal Name
+3.3VD	1	2	+3.3VD
SPI1_MISO	3	4	SPI1_MOSI

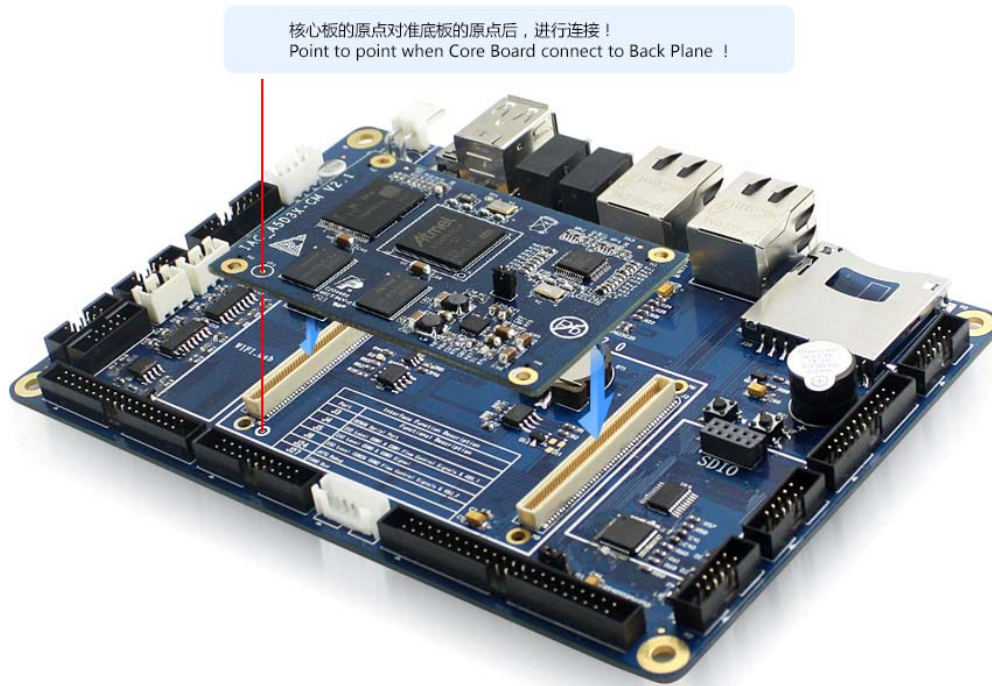
SPI1_SCLK	5	6	SPI1_NCS0
SPI1_NCS3	7	8	GND
GND	9	10	GND

J27: CAN Interface

PIN	Signal Name
1	CANH0
2	CANL0
3	GND_CAN

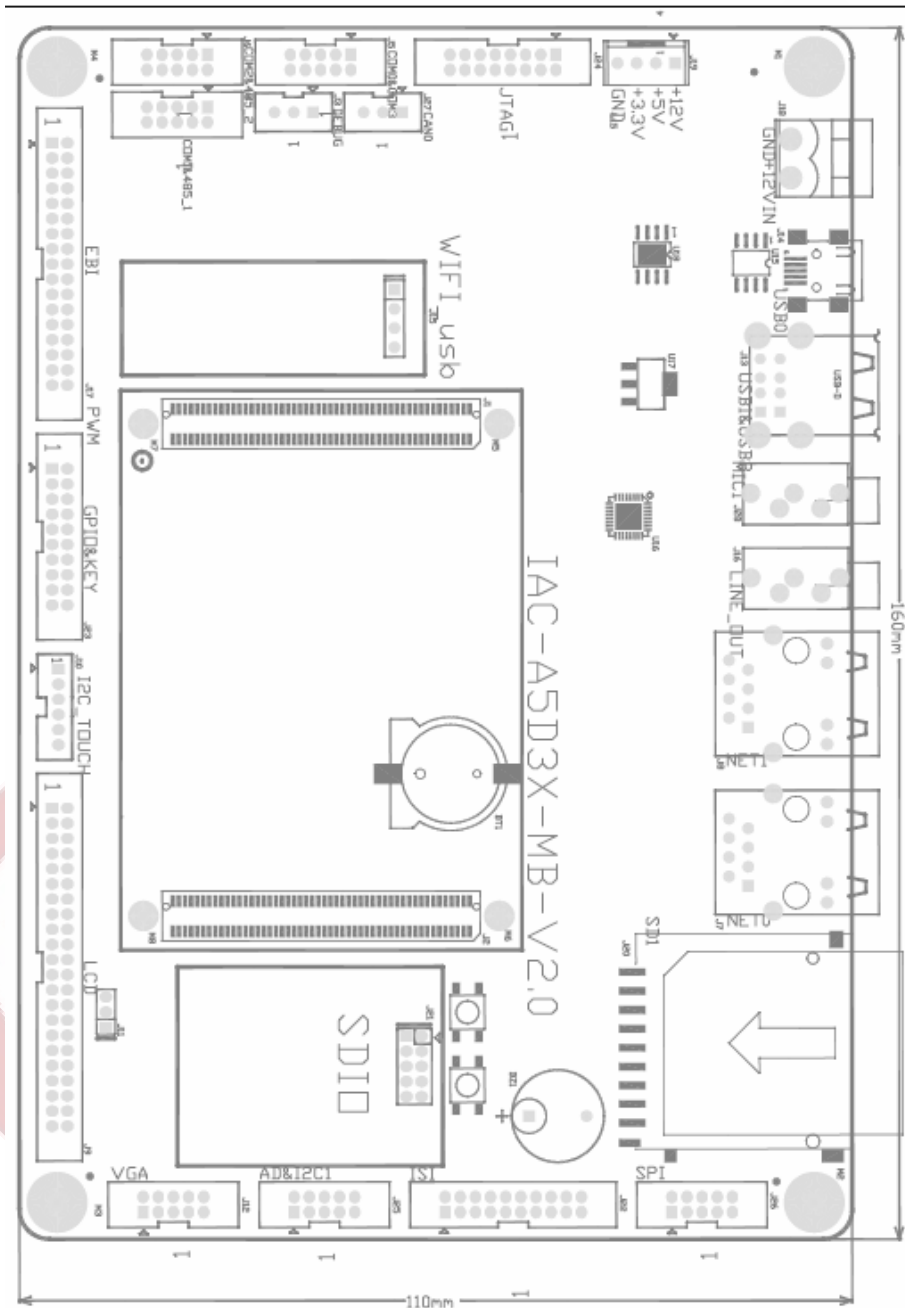
IV. Device Connection Picture

IAC-A5D3X-Kit adopts back-insert form, and core board connects to back board through 2 * 100 pins B to B connector, which constitutes the complete intelligent equipment, the connection mode is as shown:



V. Development Board Performance Index

VI. Size & Structure



VII. Software Description

IAC-A5D3X-Kit provides the software include Linux.

It introduces how to set up and employ the Linux development environment.

More detailed information, please refer to the relative documentation in IAC-A5D3X-KIT Linux User Manual.

VIII. Remark

1. Before connect to LCD, confirm LCD power specification.
2. Please use the original connecting accessories, avoid damaging the main board.
3. We ensure offering communication technology support through E-mail, telephone for lifelong technical support service.
4. We ensure offering 6 months repair service for free, if malfunction occurs in warranty because of quality problem, contact our retailer or our company with purchase receipt in warranty period, we will repair or replace it.
5. Under these circumstances, we do not offer repair for free:
 - Over warranty time;
 - Do not have purchase receipt;

- Liquid inlet, Damp or Mold;
 - Malfunction and damage is not due to product quality but drops, intense sharking, arbitrarily modify, disoperation after purchase;
 - Damage of force majeure.
6. We reserve intellectual property for the software and hardware technical data of QY-A5D3XEK; users can only use them for teaching, testing, researching. Shall not be engaged in any commercial purpose. Shall not distribute them on the Internet. Shall not intercept, modify them to tamper copyright.
7. We accept batch order; we can offer technical support and service.

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