QY-A5D3XEK Development Board

Hardware Manual

Version No.: 1.0

2013.07

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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Catalogue

Ⅰ. 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.

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1.2 Suggestion for Using QY-A5D3XEK

1. Please read the instructions first, before using the developement board;

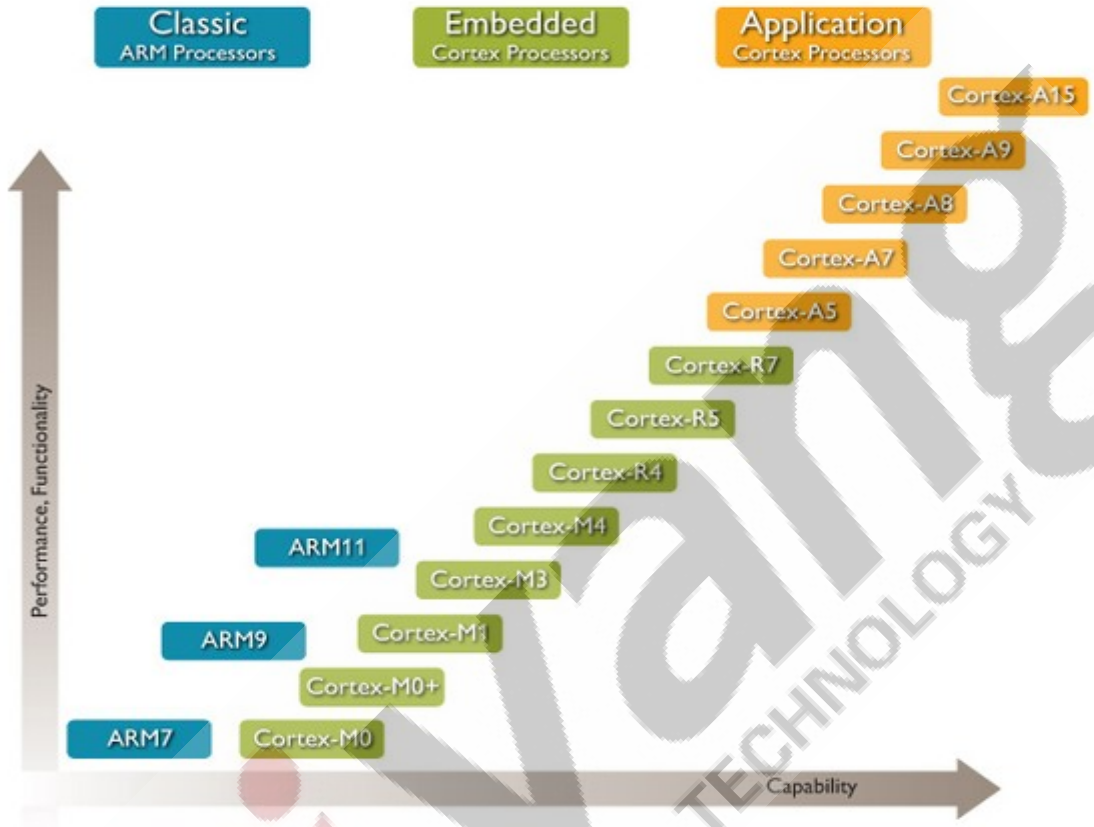
2. Before using, please check the packing list and see whether there is a missing file in the CD;

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 ***QY-A5D3XEK Linux User Manual***;

Ⅱ. System Composition

2.1 ARM Kernel Performance Comparison



picture 1

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

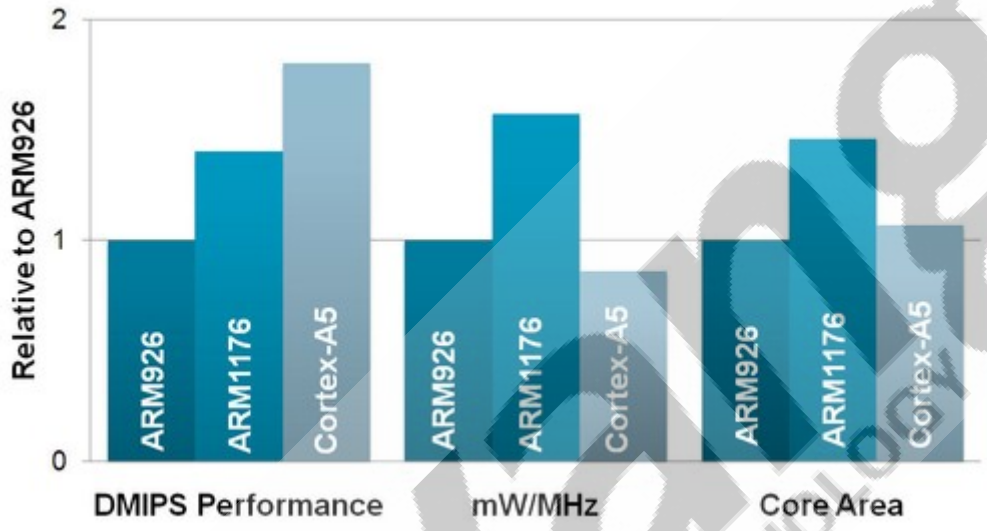
applications, featuring:

◆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

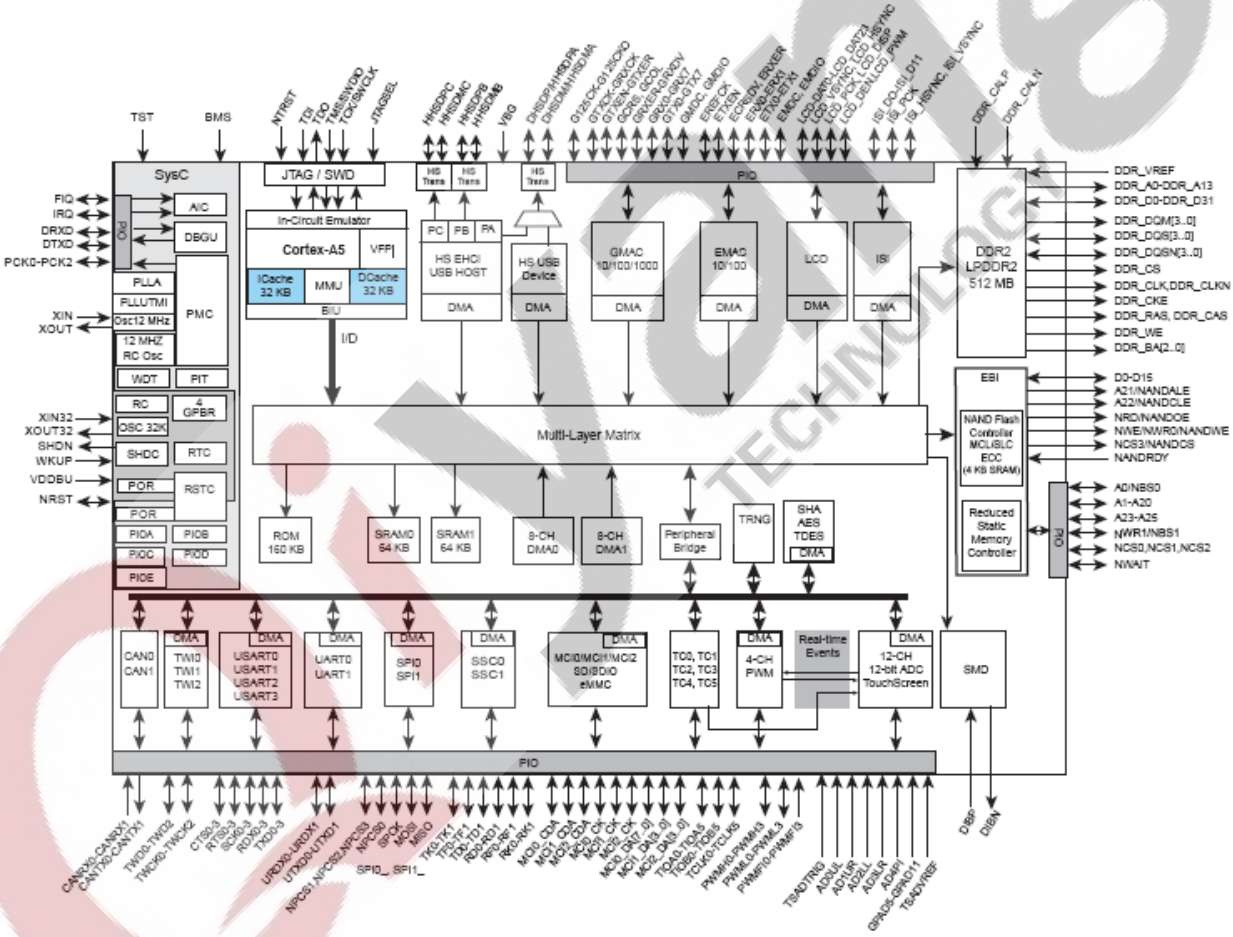
2.2 processor serious function

QY-A5D3XEK adopts ATMEL SAMA5D3X series chips and Cortex A5 kernel. Standard configuration is SAMA5D34 expanding board. For batch order users, we can replace 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				●

QY-A5D3XEK 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:



picture 2

- ◆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;

- ◆1-ch industrial Ethernet MAC(10/100MHZ);
- ◆1-ch industrial Ethernet MAC(10/100/1000MHZ);
- ◆2-ch CAN ports, support CAN2.0 A and B;
- ◆2-ch multifunction audio channel;
- ◆Common peripheral: Multichannel SPI、IIC、ISI、JTAG、timer、PWM、RTC.

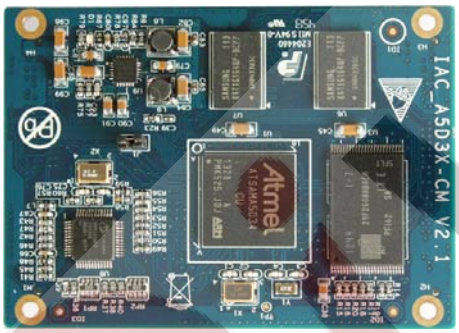
2.3 Expanding board Resource

Core Board	CPU	ATMEL SAMA5D34 CPU，ARM Cortex A5, 536MHZ	
	RAM	256M DDR2 SDRAM 256M	
	Flash	256MB NandFlash，2MB DataFlash	
	Network	DM9162 Network Chip, adopt MII mode,support 10M/100Mperfectly	
	System power	Single 5V power supply input	
Back Plane	Communication Interface	5-ch RS232 UART, 1 port as the debug UART, 2-ch RS232 Multiplexes with RS485	
		2-ch USB2.0, 1-ch high-speed OTG,1-ch USB 2.0 HOST	
		1-ch 10/100Mbps Ethernet port, with ACT/LINK indicator	
		PWM；SPI；I2C	
	Display	16-bit TFT-LCD(Compatible with 24 bits), resolution up to 2048 x 2048	
		VGA interface, can be connected with universal display	
	Audio	AC'97 binaural input, output; MIC audio input	
	Input Interface	8 * 8 matrix keyboard, and can be used as I/O,4-wire resistive touch panel	
	Memory Interface	2-ch SD card interface	
	Expansion Bus	EBI CAN bus interface	
	Other Device	Reset circuit, real-time clock, buzzer,JTAG interface	
	Power Input	+12V power supply, can support +6V~+23V wide range	
Device Manual		The component data manual	
Virtual Machine		VMware-workstation-full-9.0.2-1031769.exe	
ubuntu		ubuntu-12.04.1-desktop-i386.iso	
Cross-compiler		arm-linux-gnueabihf-gcc（gcc vision 4.7.3）	
Tool Terminal		Common terminal development debugging tool	
Source Code		Bootloader、kernel、fs source code	
Test Program		Interface using demo test program and test program source code	
Image File		Operating system image file	
User Manual		Expanding board user manual	
Schematic		schematic(PDF)	
Structure Size Chart		Back plane and core board structure size chart	
Structure Size		Core board	74mm*53mm
		Back plane	142.5mm*112mm
PCB Specification		Core board	6-layer high precision immersion gold process

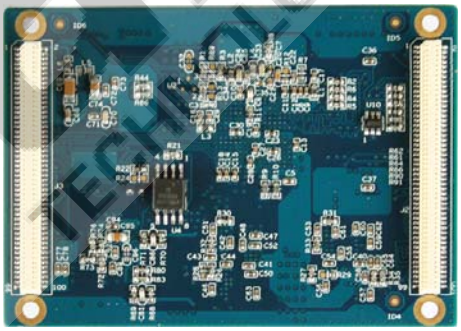
	Back plane	4-layer high precision immersion gold process
Power Consumption	≤ 2W	
Operation Temperature	-20℃ ～+70℃（can be customized）	
Humidity Range	5%~95%， Non-Condensing	

2.4 Core Board Resources

IAC-A5D3X-CM core board has high precision of 6-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.



picture 3



picture 4

◆ 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 6-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;

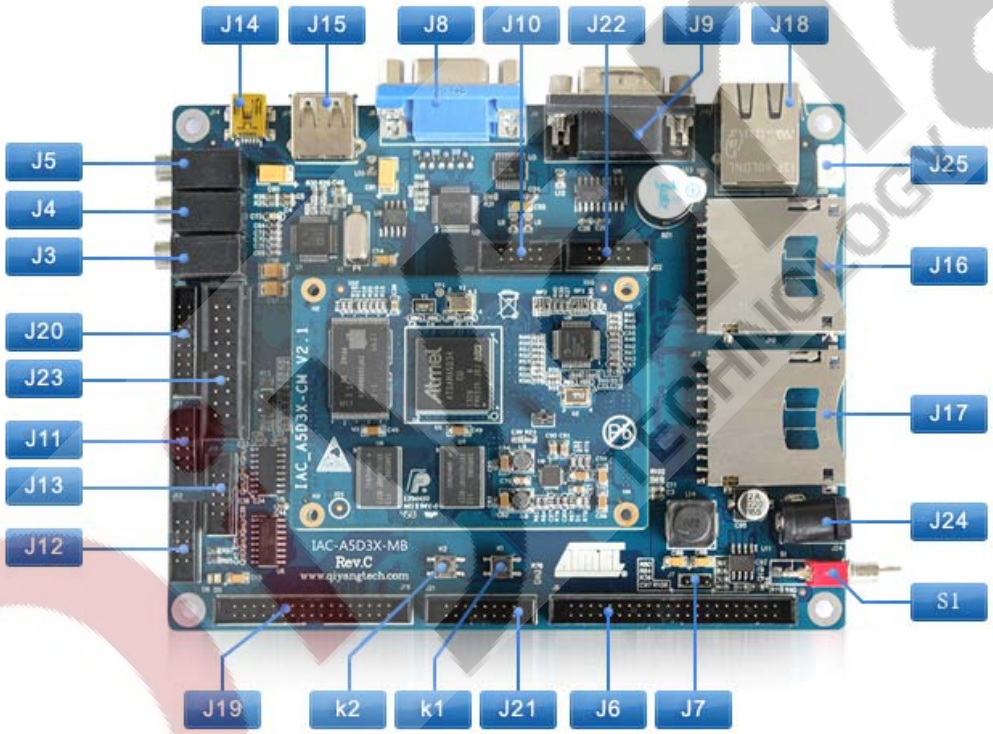
◆ Core board of the short sides are using 2 pieces of 2 * 100 B to B connector, which is convenient for hardware clipping and multiple platforms using.

◆ Power Supply: 5V, adopt TI's MPU management chip, output voltages required by core board, low power consumption, power consumption is less than 2W.

◆ Provide reset circuit and wake-up function.

2.5 Back plane Resource

It expands the standard QY-9G45/A5D3X-GP 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.



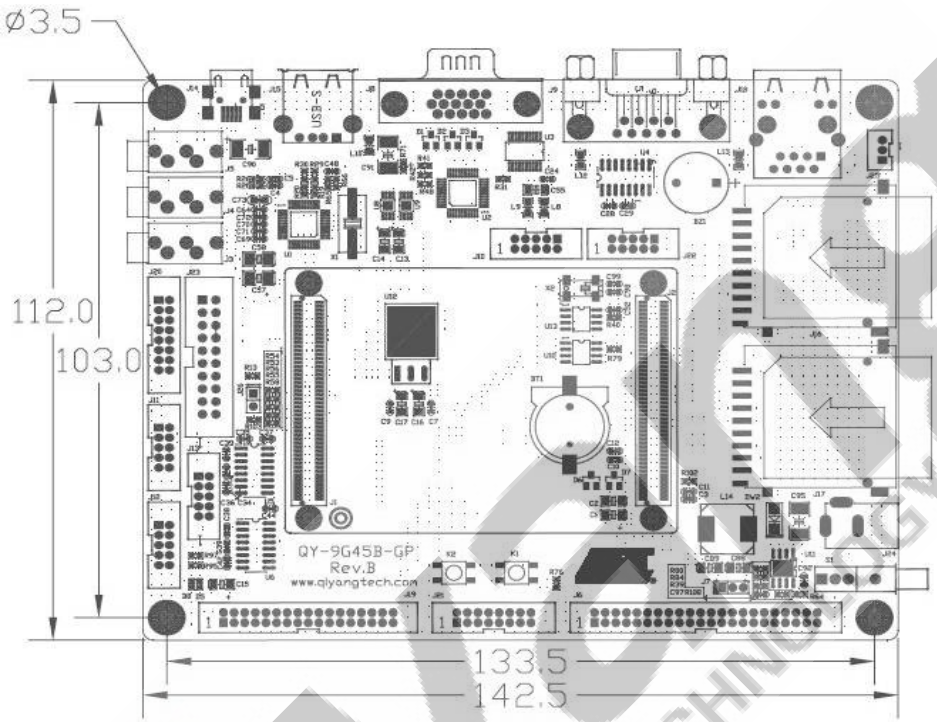
Basic Interface Function Description:

Label	Name	Function	Specification
K1	Reset Button	System Reset	System Reset
K2	Wake-Up Button	System Wake-up	System Wake-up
J3	Audio Interface	Audio output	Linear audio output
J4	Audio Interface	Audio Input	Linear Audio Input

J5	Audio Interface	Audio Input	MIC Input
J6	LCD Interface	Expanding LCD	External TFT-LCD Panel
J7	LCD Power Supply	LCD Power Supply	3.3V/5V power supply
J8	VGA	VGA Video Output	External Commen display
J9	Debug UART	Download, communication	Program download, UART Communication Development
J10	COM0	3-wire serial UART	RS232
J11	COM1	5-wire serial UART	RS232 Multiplex with RS485
J12	COM2	5-wire serial UART	RS232 Multiplex with RS485
J13	COM3	3-wire serial UART	RS232
J14	USB device	USB device	Used for downloading program and USB communication
J15	USB host	USB host	Used for Host Device
J16	SD Card 1	SD Card interface	Expand storage application conveniently and stably
J17	SD Card 2	SD Card interface	Expand storage application conveniently and stably
J18	Ethernet	10/100M Ethernet	Program download, network communication application
J19	CAN	External CAN Bus	expanding external device
J20	ISI interface	ISI interface	video application and development
J21	8 x 8 matrix keyboard	matrix keyboard	Used as common I/O
J22	SPI、PWM	SPI,PWM interface	SPI./ PWM
J23	JTAG	Simulation, Debug	Common ARM emulator use
J24	Power Interface	System Power Supply	support+6~+23 wide voltage power supply
J25	Reserve Power Supply	Resetve Power Output	3.3V/5V output
K1	Reset Button	System reset	System reset button
K2	Wake-Up Button	Wake-Up Function	Dormancy Activation
S1	Power Switch	Power Switch	Mainboard Control

Ⅲ. Size & Structure Chart

Unit: mm, if you need connector size, please email: supports@qiyangtech.com

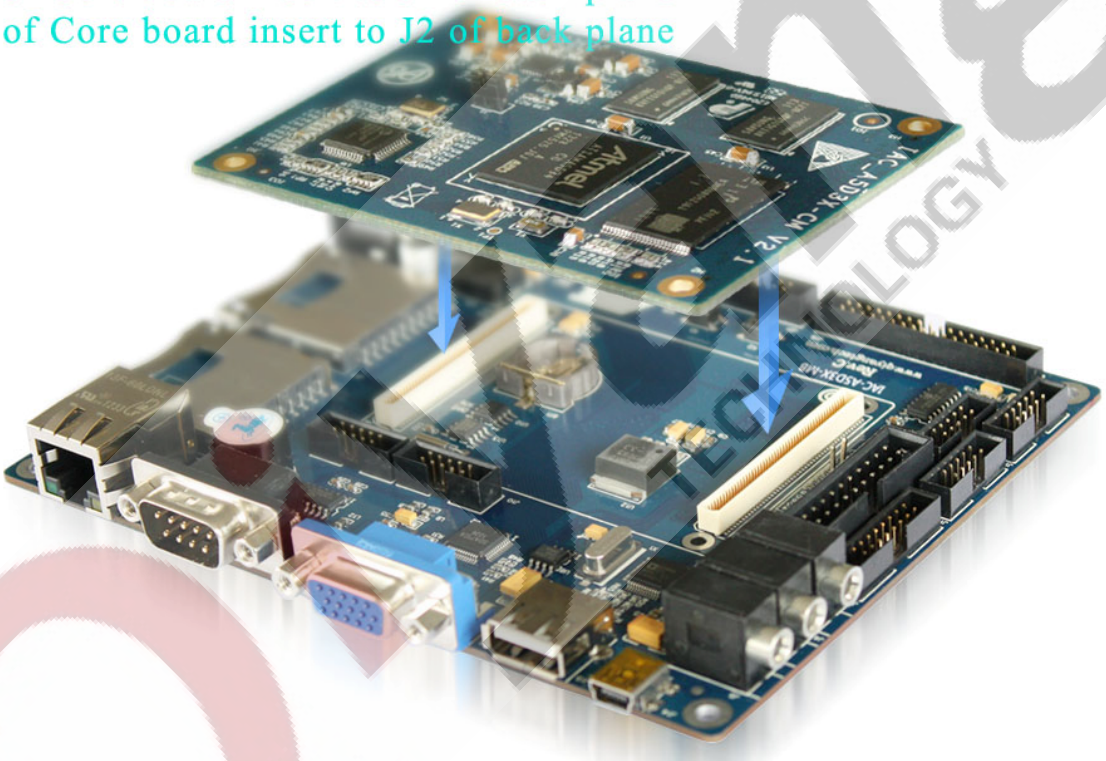


picture 5

Ⅳ. Device Connection Pictorial View

QY-A5D3XEK adopts back-insert form, and core board connects to expanding board through 2 * 100 pins B to B connector, which constitutes the complete intelligent equipment, the connection mode is as shown:

Remark:
J1 of Core board insert to J1 of back plane
J2 of Core board insert to J2 of back plane



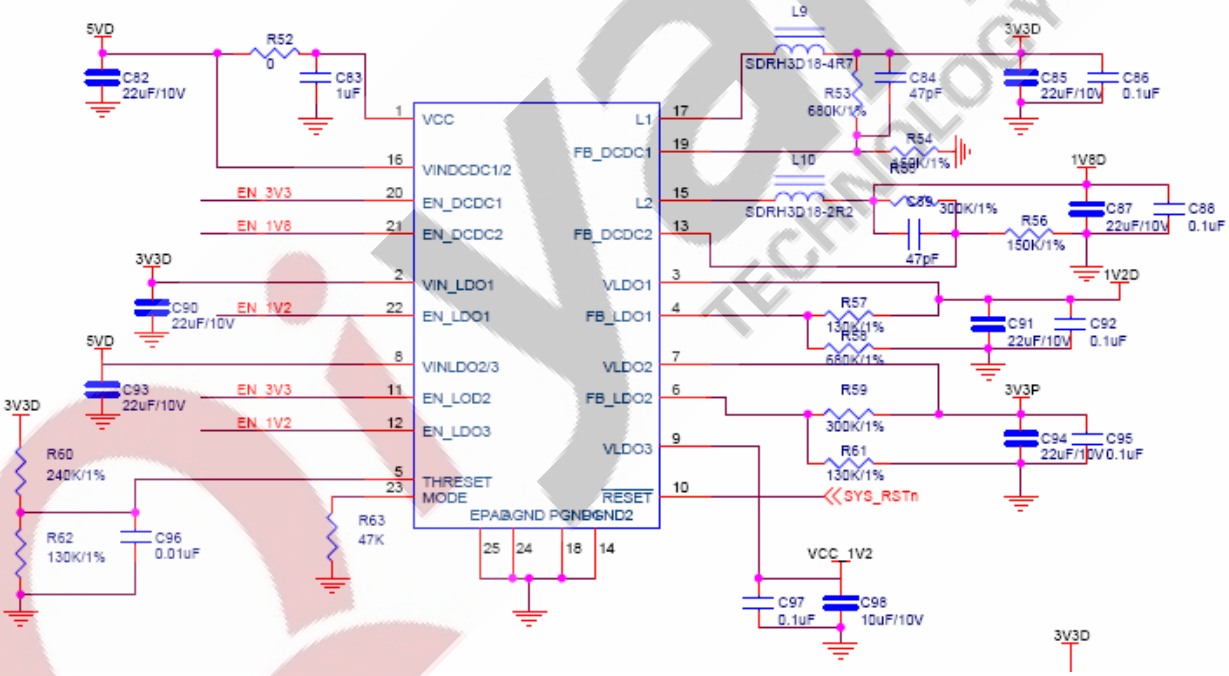
picture 6

Ⅴ. Detailed Hardware Specifications

The following information of all the chips mentioned are available in the CD in *Device Manual* folder, please query, if necessary.

5.1 Power Management Module

Core board adopts ATMEL's MPU power management module, which needs only 5V power supply. Through TPS650531RGER(U8) power management module it can output all voltage the core board needs.



picture 7

5.2 DDR2 Storage

IAC-A5D3X-CM core board adopts 256M bytes DDR2 SDRAM, by 2 pieces 8-bit DDR2 SDRAM storage （U2、U3） in parallel to 16-bit DDR2 SDRAM, data and CLK signal lines' operating speed are up to 133MHz.

5.3 NAND Flash Storage

IAC-A5D3X-CM core board provides with 256MB NAND Flash storage (U3): 32MB is used for storing system image file. Other space is used for storing client's application program, the user can make system curing and storage area distribution operations.

Now standard IAC-A5D3X-CM is 256MB, the storage can be adjusted according to customer's requirements, support 512M and so on. Only open to batched customer. Can be replaced by -40~85℃ industrial grade temperature.

5.4 DataFlash Storage

IAC-A5D3X-CM core board provides 2MB Norflash (U4), Mapping in bank0. Inside can store some startup codes, as storing [FIRSTBOOT.nb0] on Data Flash; this is a system bootloader, also can save boot logo (24-bit bmp).

5.5 Debug UART

QY-9G45/A5D3X-GP expanding board provides 1-ch Debug UART (J7). Can download Program, kernel, Bootloader, output system debug information through debug UART. The J7 is customized as debug UART, but cannot be used as a common serial port.

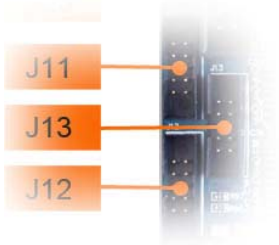
J9 Pin definition			
1	\	2	DEBUG_RXD
3	DEBUG_TXD	4	\
5	GND	6	\
7	\	8	\
9	\		

5.6 RS232 Serial Port

QY-9G45/A5D3X-GP expanding board provides 4-ch RS232, 2-ch RS232 multiplexes with RS485; J10, J13 are corresponding to COM0, COM3 separately; they are 3-wire serial port (Signals: RXD, TXD, GND). J11,J12 are corresponding to COM1,COM2 separately; they are 5-wire common serial port(Signals: RXD,TXD,GND,RTS,CTS),All interfaces can be standard DB9 UART connector through serial expansion line.

Pins are defined as follows:

J10 Pin definition			
1	\	2	RXD0
3	TXD0	4	\
5	GND	6	\
7	\	8	\
9	\	10	\



J11 Pin definition			
1	\	2	RXD1
3	TXD1	4	\
5	GND	6	\
7	RTS1	8	CTS1
9	\	10	\

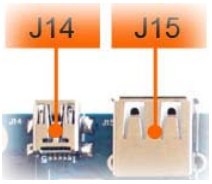
J12 Pin definition			
1	\	2	RXD2
3	TXD2	4	\
5	GND	6	\
7	RTS2	8	CTS2
9	\	10	\

J13 Pin definition			
1	\	2	RXD3
3	TXD3	4	\
5	GND	6	\
7	\	8	\
9	\	10	\

5.7 RS485 Serial Port

QY-9G45/A5D3X-GP expanding board provides 2-ch RS485 serial ports (J11,J12), realize common RS485 function.

5.8 USB



QY-9G45/A5D3X-GP expanding board provides 2-ch USB interface,1-ch USB Host (J14), 1-ch USB Device

1-ch USB Host support USB 2.0 protocol, adopts Type B USB socket, support a variety of USB flash drive, mobile hard disk, all kinds of USB Hub, USB mouse, keyboard, etc.

5.9 Ethernet

QY-9G45/A5D3X-GP expanding board provides 1-ch Ethernet interface (J18)

and the socket with Ethernet indicator. Green light is LINK indicator, yellow is 100M indicator. Two functions:

(1) common internet application

(2) QY-9G45/A5D3X-GP debugging and maintenance

Above two functions can run at the same time without affecting each other, standard cable access can be used.

5.10 Audio input/output interface

Now QY-9G45/A5D3X-GP mainboard has no audio function. If you need audio function, we can provide I^2S audio function expanding software/hardware project to you.

5.11 Matrix Keyboard

QY-9G45/A5D3X-GP expanding board provides 8*8 matrix keyboard interface(J21), users can customize 64 keys and also can be used as 16-ch I/O, Pin definition is as shown:

J21 Pin definition			
1	X0	2	Y0
3	X1	4	Y1
5	X2	6	Y2
7	X3	8	Y3
9	X4	10	Y4
11	X5	12	Y5
13	X6	14	Y6
15	X7	16	Y7

5.12 VGA

QY-9G45/A5D3X-GP expanding board provides standard 1-ch VGA interface (J8), can connect to universal displayer (LCD/CRT).

5.13 TFT-LCD

QY-9G45/A5D3X-GP expanding board provides 1-ch 18-bit TFT-LCD and touch panel interface (J6), using 2.0 spacing pin, can drive TFT-LCD panel, resolution in theory can support to 2048 * 2048, the last 4 pins of J6 are 4-wire resistive touch panel interface, pins are defined as follows:

J6 Pin definition			
1	GND	2	LCD_SPCLK
3	LCD_HSYNC	4	LCD_VSYNC
5	GND	6	LCD_D2
7	LCD_D3	8	LCD_D4
9	LCD_D5	10	LCD_D6
11	LCD_D7	12	GND
13	LCD_D10	14	LCD_D11
15	LCD_D12	16	LCD_D13
17	LCD_D14	18	LCD_D15
19	GND	20	LCD_D18
21	LCD_D19	22	LCD_D20
23	LCD_D21	24	LCD_D22
25	LCD_D23	26	GND
27	LCD_DE	28	LCD_VDD
29	LCD_VDD	30	LCD_PWR
31	LCD_MOD	32	/
33	LCD_CC	34	/
35	GND	36	/
37	ADC_D0	38	ADC_D1
39	ADC_D2	40	ADC_D3
41	TSC_XP	42	TSC_YP
43	TSC_XM	44	TSC_YM

5.14 SPI

QY-9G45/A5D3X-GP expanding board provides 1-ch SPI interface (J22) for SPI communication, also can drive SPI interface of TFT-LCD , pins are defined as follows:

J22 Pin definition			
1	+3.3VD	2	GND
3	SPI1_NCS1	4	SPI1_NCS0
5	SPI1_SPCK	6	SPI1_MISO
7	SPI1_MOSI	8	IQR_FIQ
9	PWM_D1	10	PWM_D2

5.15 PWM

QY-9G45/A5D3X-GP expanding board provides 3-ch PWM interface(J22) ,1-ch interface are used for controlling LED(D5), 2-ch interface are connected to Pin9 and Pin10 (J22) , pins are defined as follows:

J22 Pin definition			
1	+3.3VD	2	GND
3	SPI1_NCS1	4	SPI1_NCS0
5	SPI1_SPCK	6	SPI1_MISO
7	SPI1_MOSI	8	IQR_FIQ
9	PWM_D1	10	PWM_D2

5.16 ISI Image Sensor

QY-9G45/A5D3X-GP expanding board boots the ISI image sensor(J20) from the CPU. But the driver is not provided by the ATMEL. We suggest using

DIO. Pin definition is as follows:

J20 Pin definition			
1	+3.3VD	2	GND
3	ISI_D0	4	ISI_D1
5	ISI_D2	6	ISI_D3
7	ISI_D4	8	ISI_D5
9	ISI_D6	10	ISI_D7
11	ISI_PCK	12	ISI_VSYNC
13	ISI_HSYNC	14	ISI_MCK
15	I2C1_SDA	16	I2C1_SCL

5.17 I2C

QY-9G45/A5D3X-GP expanding board provides 1-ch I^2C interface(J20) for I^2C communication, pins are defined as above picture:Pin15 and Pin16.

5.18 JTAG

QY-9G45/A5D3X-GP expanding board provides 1-ch JTAG interface(J23) with 10 pin, , and can connect to common simulator. For example: J-LINK V.5 or higher can use it. But for QY-9G45/A5D3X-GP platform, we will provide you a serial port, Ethernet port, USB port to download Bootload. Compile application software in WinCE/Linux system. We do not suggest to use simulator.

J23 Pin definition			
1	+3.3VD	2	+3.3VD
3	JTAG_NTRST	4	GND
5	JTAG_TDI	6	GND
7	JTAG_TMS	8	GND

9	JTAG_TCK	10	GND
11	JTAG_RTCK	12	GND
13	JTAG_TDO	14	GND
15	nRESET	16	GND
17	\	18	GND
19	\	20	GND

5.19 EBI

QY-9G45/A5D3X-GP expanding board provides 1-ch EBI Can bus interface (J19), and boots two chip selects :NCSO and NCS1, address wire is A2~A9, data width is 16-bit, EBI interface is defined as follows:

J19 Pin definition			
1	+3.3VD	2	+3.3VD
3	EBI_IRQ	4	EBI_NCS0
5	EBI_NCS1	6	EBI_NRD
7	EBI_NWE	8	EBI_NWAIT
9	EBI_A2	10	EBI_A3
11	EBI_A4	12	EBI_A5
13	EBI_A6	14	EBI_A7
15	EBI_A8	16	EBI_A9
17	EBI_D0	18	EBI_D1
19	EBI_D2	20	EBI_D3
21	EBI_D4	22	EBI_D5
23	EBI_D6	24	EBI_D7

25	EBI_D8	26	EBI_D9
27	EBI_D10	28	EBI_D11
29	EBI_D12	30	EBI_D13
31	EBI_D14	32	EBI_D15
33	GND	34	GND

5.20 SD

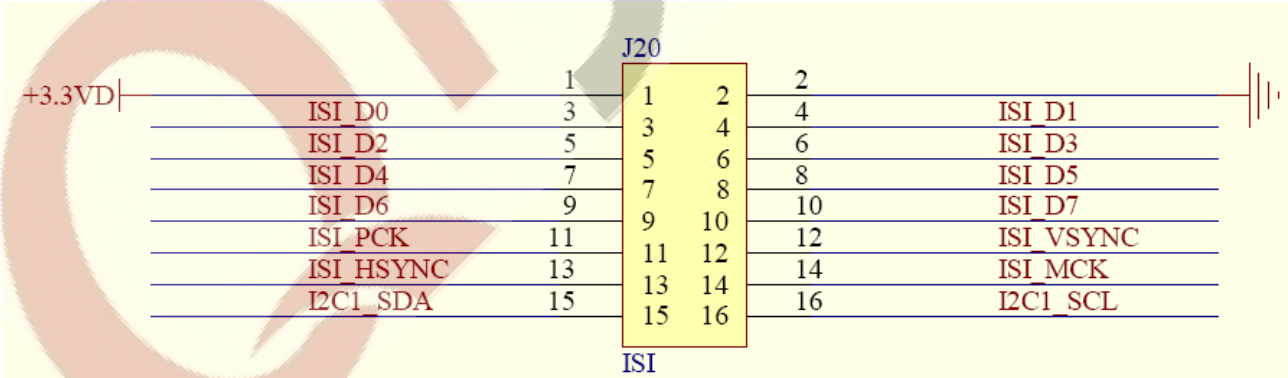
QY-9G45/A5D3X-GP expanding board has 2 * SD card storage slots (J16, J17), users can insert SD card to expand storage capacity.

5.21 CAN

QY-9G45/A5D3X-GP core board boots1-ch CAN interface.

QY-9G45/A5D3X-GP expanding board, do not has independent CAN circuit and interface.

If you need CAN interface, you can expand CAN through external transceiver as the following illustration



picture 8

Pin3 and Pin5(J20) corresponds to the following CAN transmitting and receiving signal:

ISI_D0 ---- CAN_RX
ISI_D2 ---- CAN_TX

5.22 RTC

QY-9G45/A5D3X-GP's battery are used for keeping RTC in CPU to work normally. Use CR1220 button battery; When the board powers on, VDD3.3 will supply power to RTC; The expanding board provides external RTC support. Use the DS1338 RTC chip.

5.23 Hardware Reset Button

QY-9G45/A5D3X-GP expanding board 's RESET button (K1) is the hardware reset button on board. Boots AT91SAM9G45 processor's reset pin. Support both manual reset and power-on reset.

5.24 Power

J24 is power input port of whole QY-9G45/A5D3X-GP expanding board, wide voltage range refers to supporting +6V~+25V. We advice standard DC+12V@2A power to supply expanding board. Plug specification :positive inside/negative outside.

Ⅵ. 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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