



IAC-335X-KIT Development Board Hardware Manual

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Catalogue

I. Preface.....	3
1.1 Company Profile:.....	3
1.2 Suggestion for Using IAC-335X-Kit.....	4
II. System composition.....	4
2.1 Chip summary.....	4
2.2. Development Board Resource	7
2.3 Core Board Resources	8
2.4 Back plane Resource.....	9
III. Size & Structure Chart.....	12
3.1 Back Plane Size	12
IV. Device Connection Pictorial View.....	13
V. Detailed Hardware Specifications	15
5.1 Power Management Module.....	15
5.2 DDR2 Storage.....	16
5.3 NandFlash Storage.....	16
5.4 DataFlash Storage.....	16
5.5 Debug UART	16
5.6 RS232 Serial Port	17
5.7 RS485 Serial Port	19
5.8 USB	20
5.9 SD Card	20
5.10 Ethernet.....	21
5.11 Audio.....	21
5.12 VGA.....	22
5.13 TFT-LCD	23
5.14 AD Input Interface.....	25
5.15 CAN Bus Interface	25
5.16 RTC.....	26
VI. Remark	27

I. Preface

1.1 Company Profile:

Hangzhou Qiyang Intelligent 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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1.2 Suggestion for Using IAC-335X-Kit

- (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-335X-Kit Linux User Manual*;

II. System composition

2.1 Chip summary

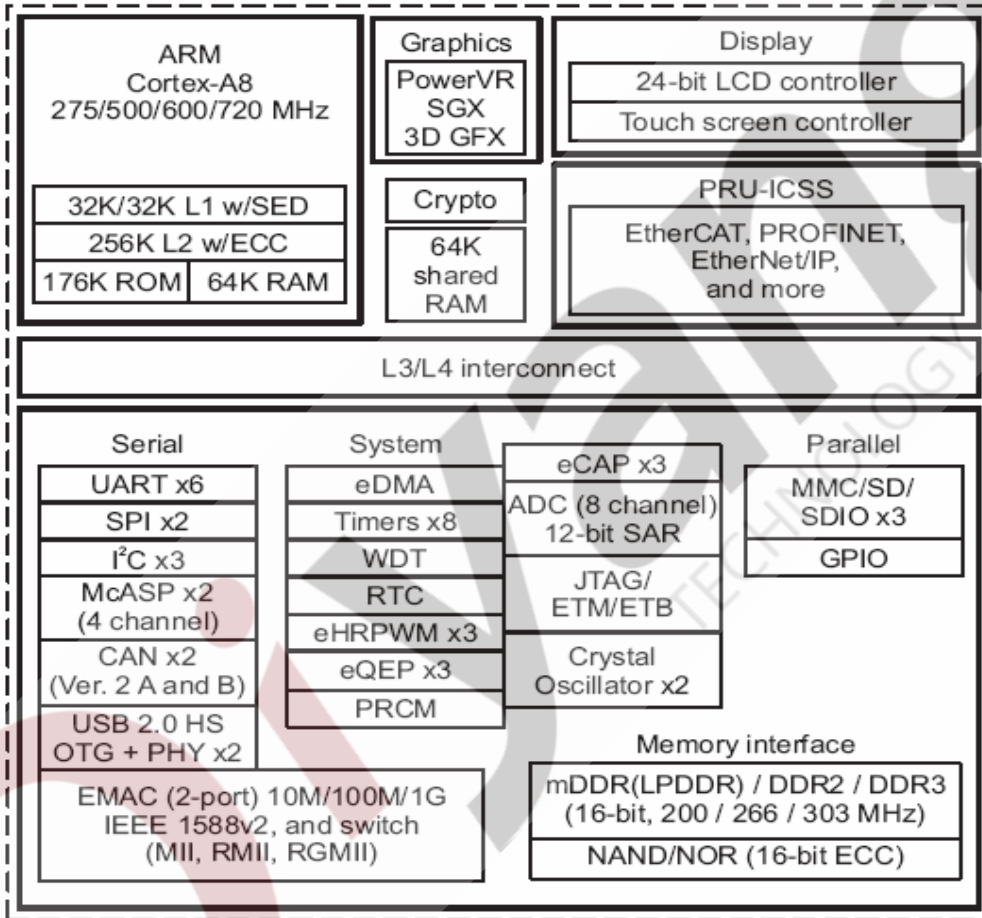
IAC-335X-Kit adopts TI AM335X series chips. For batch order users, we can replace different chips to lower cost. Standard configuration is AM3359 development board.

Please see the following detailed introduction:

AM3359 is the ARM Cortex-A8 series of 32-bit reduced instruction set computing (RISC) microprocessor released by TI (Texas instruments). The processor is equipped with NEON™ single instruction multiple data flows (SIMD) coprocessor, which has

the single fault detection (parity) of the 32 KB L1 instruction cache and 32 KB data cache and also has error correcting code (ECC) of 256 KB L2 cache. In addition AM3359 has extremely abundant interface resource.

Device Connection Pictorial View:



picture 1

- ◆ ARM Cortex-A8,720MHZ;
- ◆ NEON™ SIMD Coprocessor, L2 Cache;
- ◆ 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 gigabit Ethernet MAC(10/100/1000MHZ);
- ◆ 2-ch CAN ports, support CAN2.0 A and B;
- ◆ Integrated 2-ch PRU modules;

- ◆ 2-ch multifunction audio channel;
- ◆ Common peripheral: Multichannel SPI, IIC, timer, PWM, DMA, RTC, etc.
- ◆ SGX530 3D Graphics Engine.

AM335X series chip:

Label	ARM CPU	ARM MHz(MAX.)	ARM MIPS(MAX.)	Graphics Acceleration	Other Hardware Acceleration
AM3359	1 ARM Cortex-A8	275 600 720	1200 1440	1 3D	2 PRU-ICSS Crypto Accelerator
AM3358	1 ARM Cortex-A8	275 600 500 720	1000 1200 1440	1 3D	2 PRU-ICSS Crypto Accelerator
AM3357	1 ARM Cortex-A8	275 600 720	550 1200 1440		2 PRU-ICSS Crypto Accelerator
AM3356	1 ARM Cortex-A8	275 600 500 720	550 1000 1200 1440		2 PRU-ICSS Crypto Accelerator
AM3354	1 ARM Cortex-A8	275 600 500 720	1000 1200 1440	1 3D	Crypto Accelerator
AM3352	1 ARM Cortex-A8	275 600 500 720	1000 1200 1440		Crypto Accelerator

picture 2

2.2. Development Board Resource

Hardware Resources	Core Board	CPU	TI AM3354 CPU,ARM Cortex-A8 720MHz
		RAM	256MB DDR2
		Flash	256MB NandFlash,2MB DataFlash
		Network	AR8035 Network Chip, adopt RGMII mode, support 10M/100M/1000M perfectly
		Power	Single 5V power supply input,
	Back Plane	Communication Interface	5-ch RS232 UART, 1 port (com0) as the debug UART, 2-ch RS232 Multiplexes with RS485
			2-ch USB2.0, high-speed OTG
			2-ch 10/100/1000Mbps Ethernet port, with ACT/LINK indicator
		Display	16-bit TFT-LCD(Compatible with 18,24 bits), resolution up to 1366*860
			VGA interface, can be connected with universal display
		Audio	McASP audio interface; binaural input, output; MIC audio input
		Input Interface	4-wire resistive touch panel
		Expansion Bus	2-ch CAN bus interface, support CAN2.0A&B protocol
		Expansion Bus	16-bit GPMC bus is used to connect peripherals such as FPGA and FLASH
		Memory Interface	SD card interface
		Other Device	Reset circuit, wake-up function, real-time clock, buzzer, JTAG interface
		Power Input	+12V power supply, can support +4.75V~+18V wide range

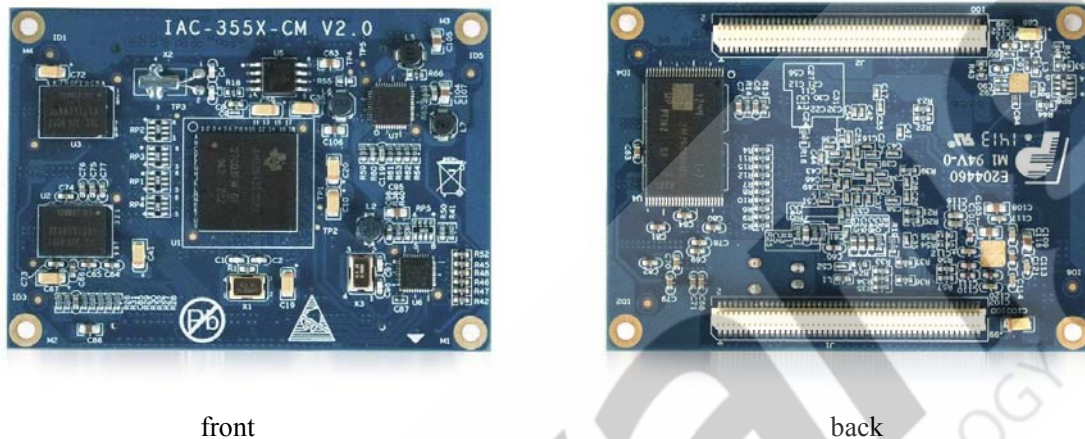
			voltage power supply	
Linux CD Resource	Device Manual	The component data manual		
	Virtual Machine	VMware-workstation-full-9.0.2-1031769.exe		
	ubuntu	ubuntu-12.04.1-desktop-i386.iso		
	Cross-compiler	arm-arago-linux-gnueabi.tar.gz (gcc version 4.5.3)		
	Tool Terminal	Common terminal development debugging 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	Development board user manual		
	Schematic	schematic(PDF)		
	Structure Size Chart	Back plane structure size chart		
	TI reference material	TI authority AM3354 reference material		
Electrical Specification	Structure Size	Core board	74mm*53mm	
		Back plane	142mm*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°C~+70°C		
	Humidity Range	5% ~ 95%, Non-Condensing		

picture 3

2.3 Core Board Resources

The 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, NandFlash (the back), network chip, clock chip crystal

oscillator, as many as 200pins. It fully expands the AM335X hardware resources and the user can make combination of different interface functions by reusing pin, and make the most qualified back plane.



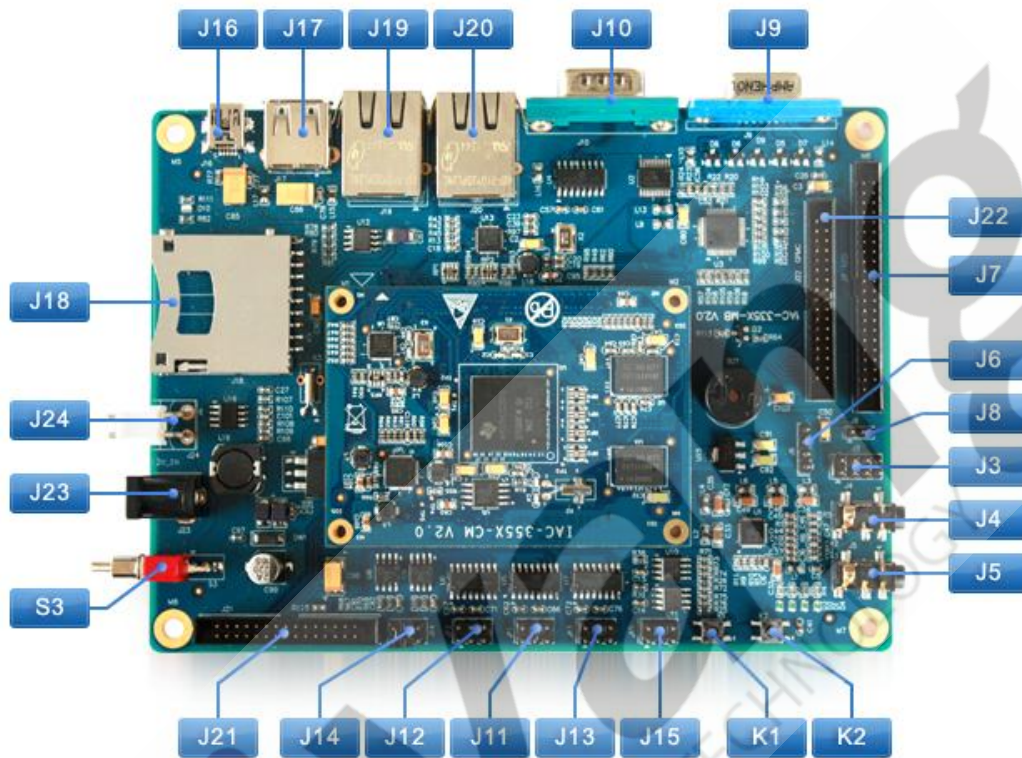
picture 4

- ◆ TI AM3354 CPU,720MHz;
- ◆ 256M DDR2 SDRAM,256MB NandFlash,2MB DataFlash;
- ◆ AR8035 network chip, support 10M/100M /1000M adaptable Ethernet with RGMII mode;
- ◆ IAC-335X-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*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 less than 2W.
- ◆ Provide reset circuit and wake-up function.

2.4 Back plane Resource

It expands the standard IAC-335X-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 AM335X, which users can

customize it base on their own needs.



picture 5

Basic Interface Function Description:

Label	Name	Function	Specification
J3	Audio Interface	Audio play and output	For audio application
J4	Audio output	Binaural audio output	For audio application
J5	Audio input	Binaural audio input	For audio application
J6	ADC	4-bit AD input	For ADC application
J7	LCD Interface	LCD Interface	External TFT-LCD Panel
J8	Power Supply	LCD Power Supply	3.3V/5V power supply

			jumper optional
J9	VGA	VGA Video Output	External VGA display
J10	Debug UART	Download, Debug	Program download, communication, debugging
J11	COM2/3	3-wire serial port	RS232
J12	COM4/5	3-wire serial port	RS232
J13	COM1	3-wire serial port	RS232
J14	485	2-ch RS485	Multiplex with com4,com5
J15	CAN	CAN Bus	CAN Bus Application
J16	USB Device	OTG USB OTG	Used for Host Device
J17	USB host	USB 2.0 host	Connect a USB device
J18	SD Card	SD/MMC Card Interface	Expand storage application conveniently and stably
J19	1Ethernet 1	10/100/1000M Ethernet	Program download, network communication application
J20	2Ethernet 2	10/100/1000M Ethernet	Program download, network communication application
J21	GPIO、SPI	expanding external device	expanding external device
J22	GPMC	expanding external device	expanding external device
J23	Power Input	Development board Power Input	support+4.7~+18 wide voltage power supply
J24	Power Input	12V Power input	interface optional
K1	Wake-Up Button	System Wake-up	System Wake-up function
K2	Reset Button	System reset	System reset function

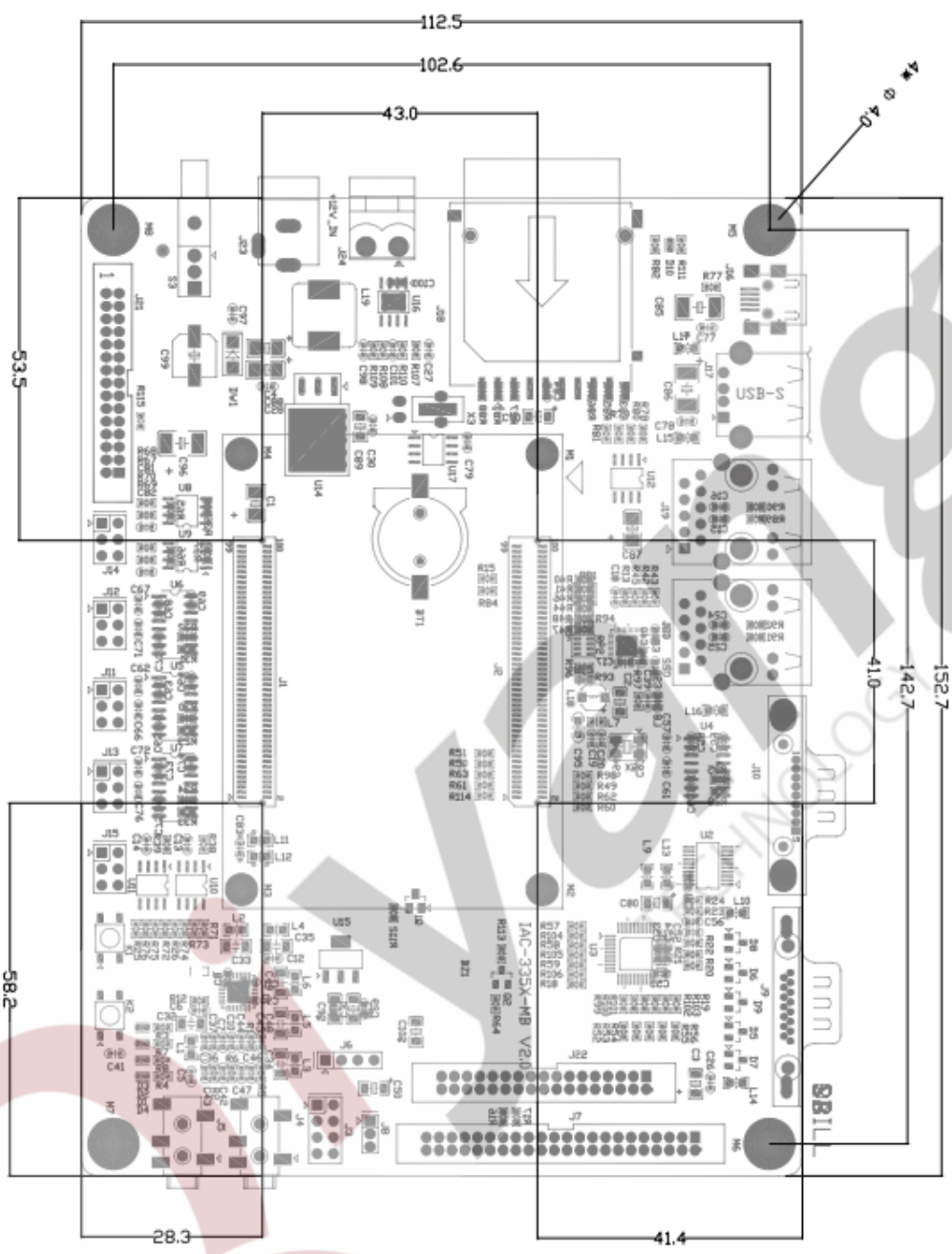
S3	Power Switch	Power Switch	Power Supply Switch Control
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picture 6

III. Size & Structure Chart

3.1 Back Plane Size

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



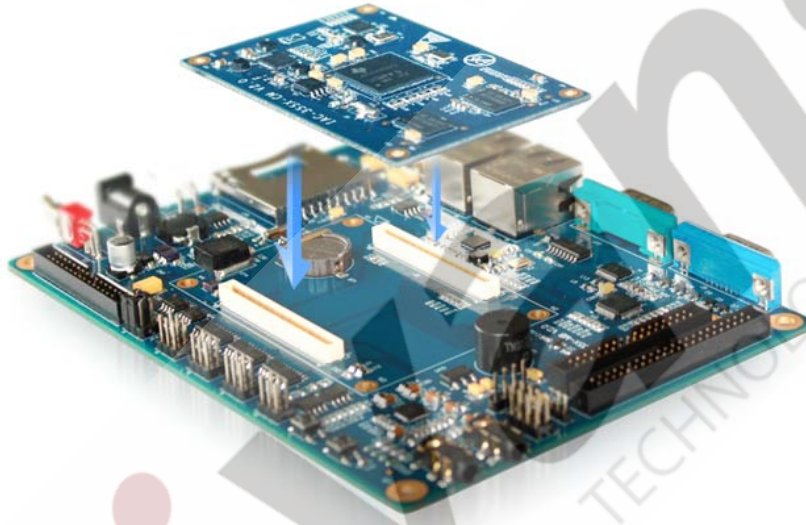
picture 7

IV. Device Connection Pictorial View

IAC-335X-Kit adopts back-insert form, and core board connects to development

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



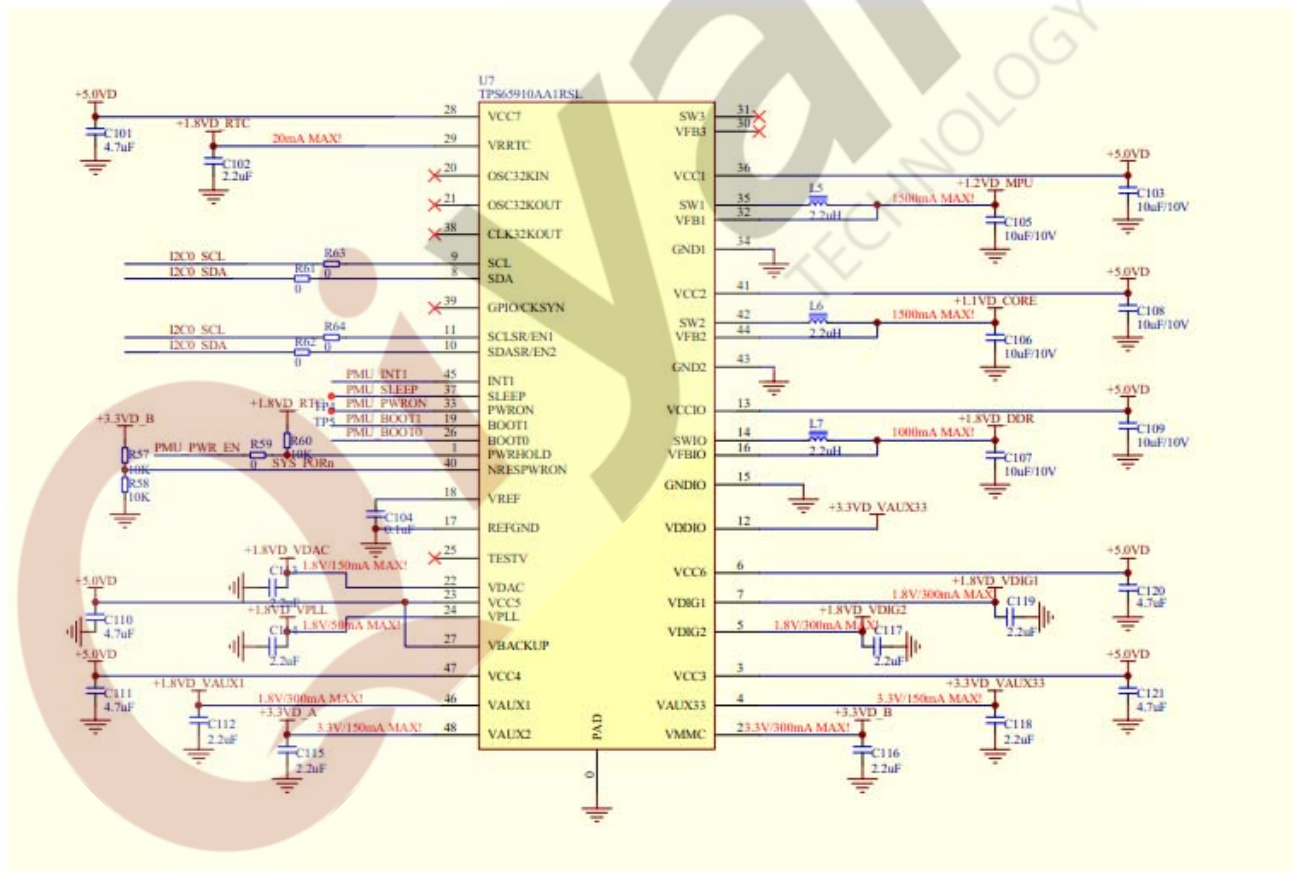
picture 8

V. Detailed Hardware Specifications

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

5.1 Power Management Module

Core board adopts TI's MPU power management module, which needs only 5V power supply separately. through TPS65910AA1RSL (U7) power management module it can output all voltage the core board needs.



picture 9

5.2 DDR2 Storage

IAC-335X-CM core board adopts 256M bytes DDR2 SDRAM, by 2* 8-bit DDR2 SDRAM storage to 16-bit DDR2 SDRAM in parallel, data and CLK signal lines' operating speed are up to 133MHz.

5.3 NAND Flash Storage

IAC-335X-CM core board provides with 256MB NAND Flash storage (the back U4): 32MB is used to store system image file. Other space is used to store client's application program, the user can make system curing and storage area distribution operations.

5.4 DataFlash Storage

IAC-335X-CM core board provides 2MB Nor flash (U5), 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

IAC-335X-MB development board provides Debug UART (J10).Used in development, output system debugging information, but cannot be used as a common serial port.

5.6 RS232 Serial Port

IAC-335X-MB development board provides 5-ch RS232, expand serial port chip ZT3232 (development board U4, U5, U6, U7), 2-ch RS232 com4/com5 multiplex with RS485; J13, J12, J11 are corresponding to COM1, COM2/3, COM4/5 separately; They are 3-wire serial port, signal: RXD, TXD, GND. All interfaces can be DB9 standard serial port connector through serial expansion line. Pins are defined as follows:

J11 pin definition: COM2/3 Interface

1	J_RXD2	2	J_RXD3
3	J_TXD2	4	J_TXD3

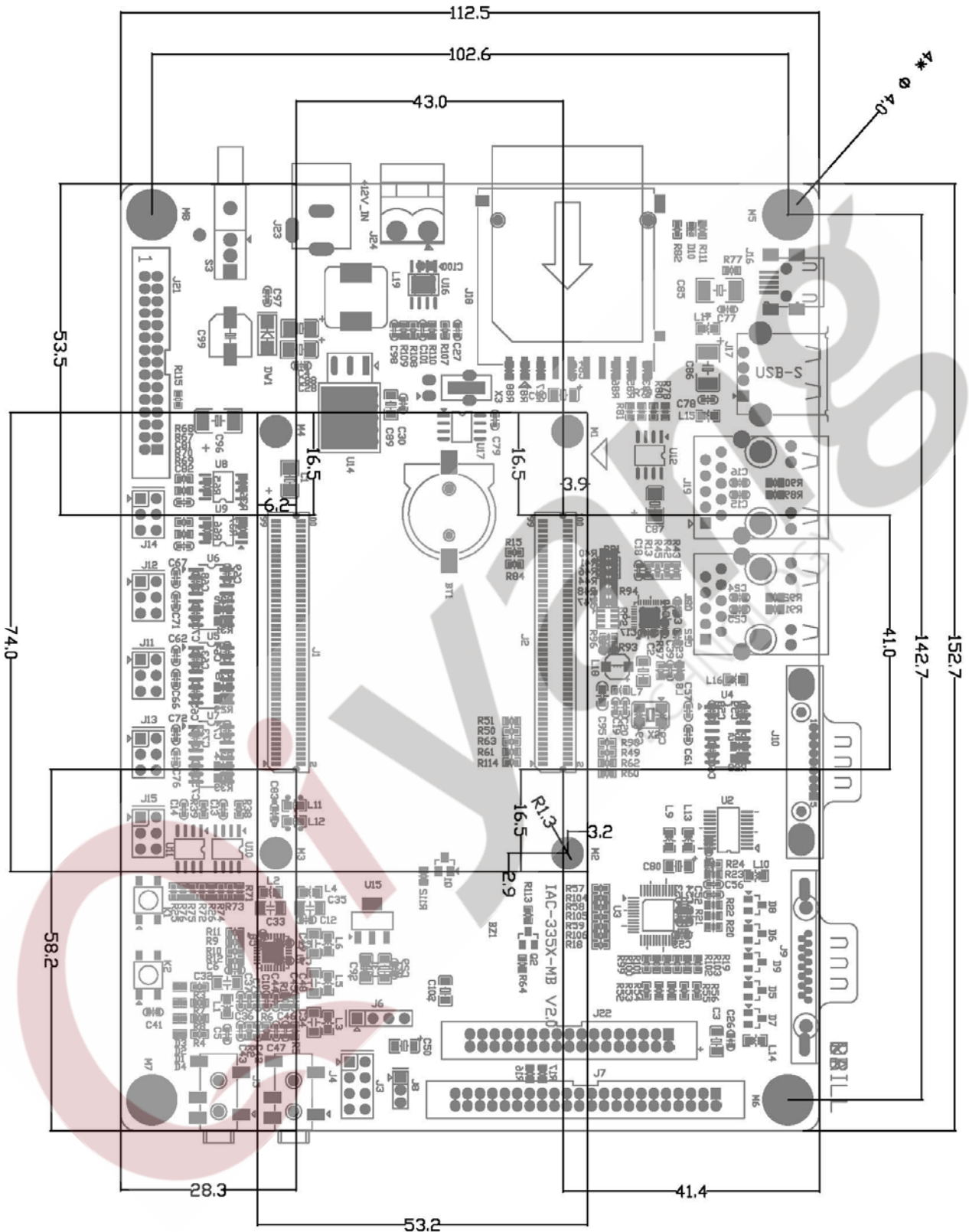
picture 10

J12 pin definition: COM4/5 Interface

1	J_RXD4	2	J_RXD5
3	J_TXD4	4	J_TXD5
5	GND	6	GND

picture 11

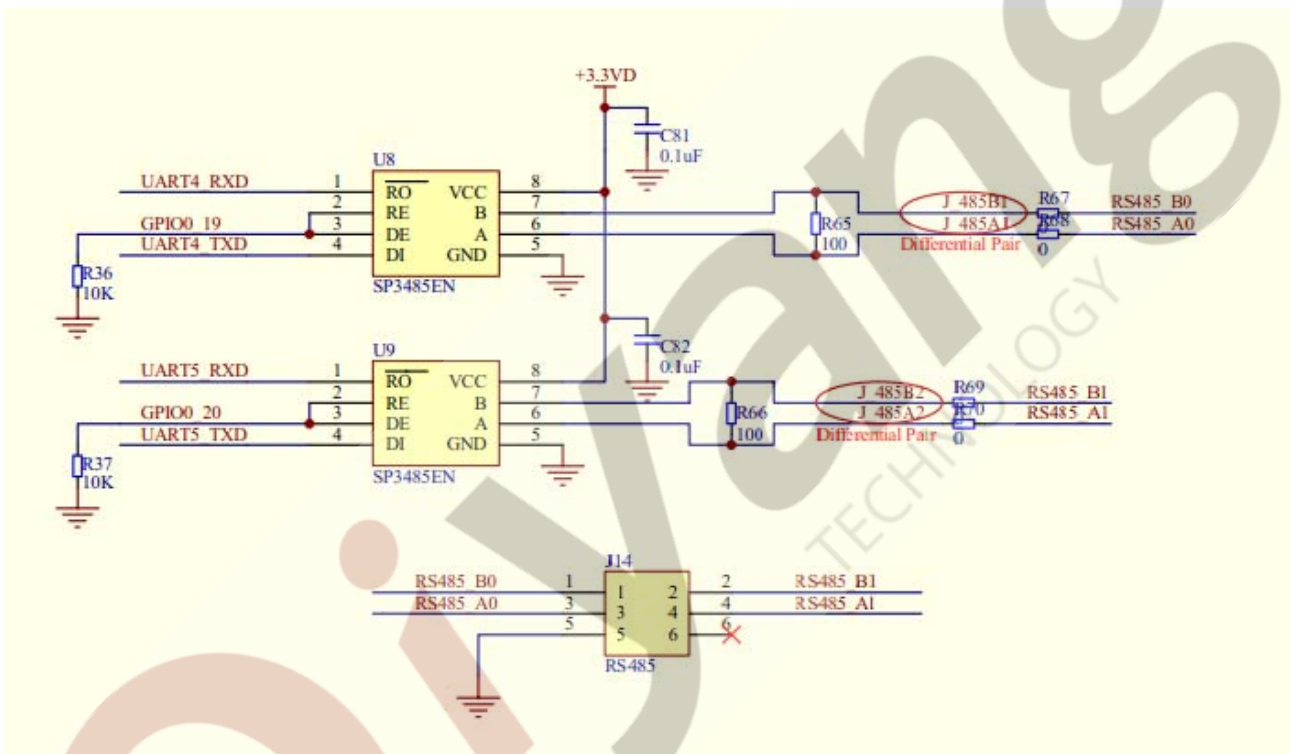
J13 pin definition: COM1 Interface



picture 12

5.7 RS485 Serial Port

IAC-335X-MB development board provides 2-ch RS485 serial port (J14). They multiplex with RS232 UART COM4,COM5 .Corresponding expansion chip U8, U9 (SP3485).



picture 13

J14pin definition: RS485

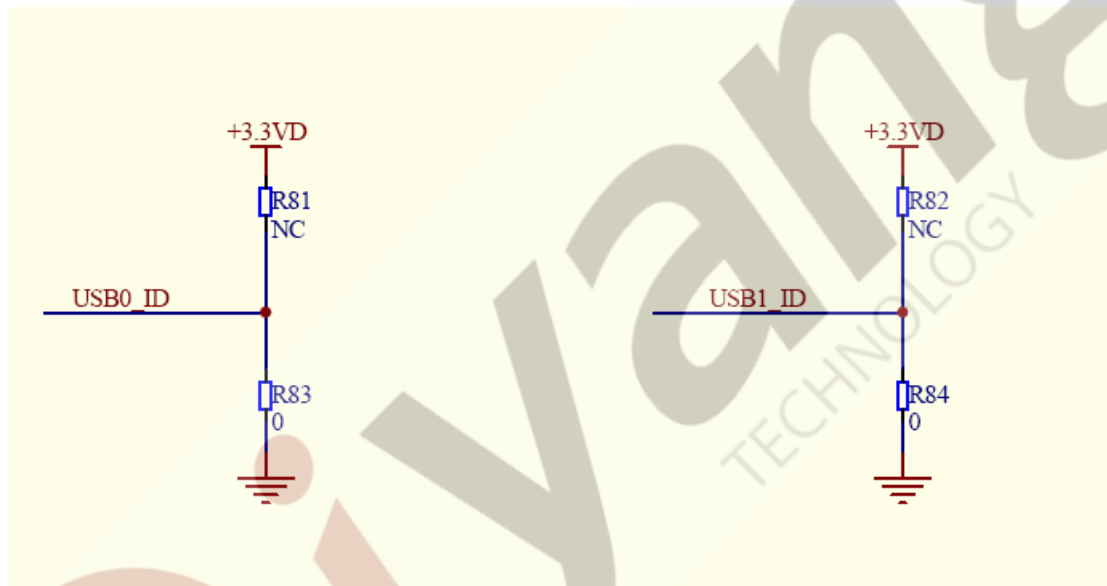
1	RS485_B0	2	RS485_B1
3	RS485_A0	4	RS485_A1
5	GND	6	GND

picture 14

5.8 USB

IAC-335X-MB development board provides 1-ch USB Host (J17), support USB 2.0, support a variety of USB flash drive, mobile hard disk, all kinds of USB Hub, USB mouse, keyboard, etc.

1-ch USB OTG interface(J16) defaults to USD Device; hardware reserve jumper wire resistance control, can be configured to USB Host.



picture 15

Remark: USB_ID Signal:

UP	USB_Device
DOWN	USB_Host

picture 16

5.9 SD Card

IAC-335X-MB development board has 1 * SD card interface (J18), adopts standard SD card slot, support various storage capacity of SD card (32 * 24 *

2.1mm).

5.10 Ethernet

IAC-335X-MB development board provides 2-ch Ethernet interface (J19, J20); RJ45 with Ethernet indicator.

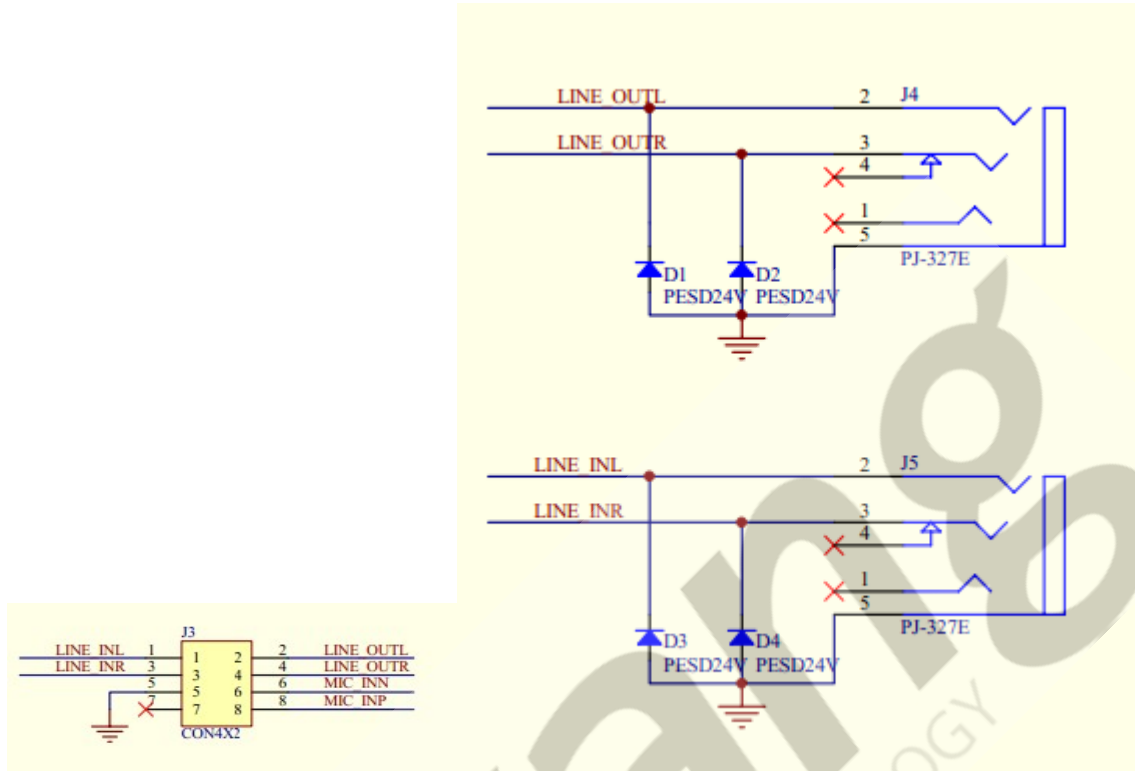
J19: Ethernet expansion chip on core board (U6)

J20: Ethernet expansion chip on back plane (U13)

The above 2-ch Ethernet ports are gigabit Ethernet port, support 10M/100M/1000M adaptively Ethernet port, connect to standard network cable.

5.11 Audio

IAC-335X-MB development board provides audio input/output(J4,J5), adopts McASP interface, realize 1-ch audio output, can connect to earphone and active speaker, binaural line input and MIC interface input. Audio expansion chip adopts TI's TLV320AIC31IRHB (U1), specific expansion scheme please view audio part in schematic diagram, input/output interface as shown:



picture 17

Remark: J3 includes MIC audio input, J4 is binaural audio output, and J5 is binaural audio input.

5.12 VGA

IAC-335X-MB expanding board provides standard 1-ch VGA interface (J9), standard DB15 interface, can connect to universal displayer (LCD/CRT).

It expanded by LCD-TTL signal in parallel, specific expansion circuit, please view LCD display part in schematic diagram.

5.13 TFT-LCD

IAC-335X-MB expanding board provides 1-ch 16-bit (RGB565 mode) TFT-LCD and touch panel interface (J7), using 2.0 spacing 44 pin socket, can drive TFT-LCD panel, resolution in theory can support to 2048 * 2048, in practical we suggest using maximum support to 800 * 600 which is the best result without dithering, ghosting and other bad phenomena, the last 4 pins of J7 are 4-wire resistive touch panel interface, pins are defined as follows:

J7 pin definition: LCD Interface:

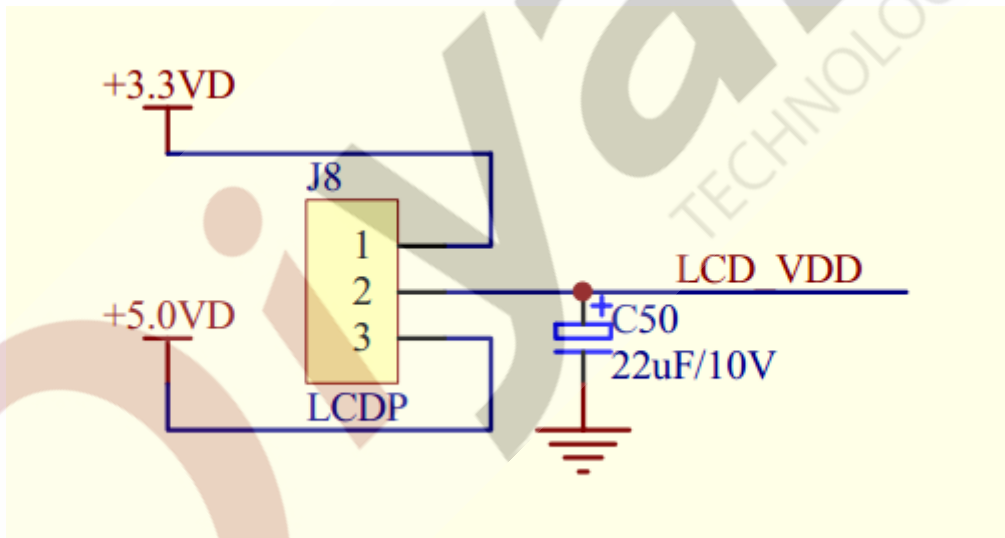
1	GND	2	LCD_PCLK
3	LCD_HSYNC	4	LCD_VSYNC
5	GND	6	GND
7	LCD_D11	8	LCD_D12
9	LCD_D13	10	LCD_D14
11	LCD_D15	12	GND
13	LCD_D5	14	LCD_D6
15	LCD_D7	16	LCD_D8
17	LCD_D9	18	LCD_D10
19	GND	20	GND
21	LCD_DO	22	LCD_D1
23	LCD_D2	24	LCD_D3
25	LCD_D4	26	GND
27	LCD_DE	28	LCD_VDD

29	LCD_VDD	30	LCD_L/R
31	LCD_U/D	32	NC
33	LCD_CTL	34	NC
35	GND	36	NC
37	GND	38	GND
39	GND	40	GND
41	AD_IN0	42	AD_IN2
43	AD_IN1	44	AD_IN3

picture 18

Remark: Confirm the drive voltage for the LCD, select 3.3V/5V by jumper (J8)

J8 pin definition: LCD power supply, select voltage according to LCD panel.



picture 19

Instruction:

Pin1 connect with pin2 is +3.3V power supply

Pin2 connect with pin3 is +5V power supply

Remark:

If LCD needs 5V power supply, jumper 3.3V may appear unstable voltage and flash screen situation;

If LCD need 3.3V power supply, jumper 5V may appear dithering, ghosting screen and long time work may cause LCD damage.

5.14 AD Input Interface

CPU with 8-ch 12-bit ADC: 4-ch 12-bit ADC are for touch panel signal, another 4-ch ADC is in J6.

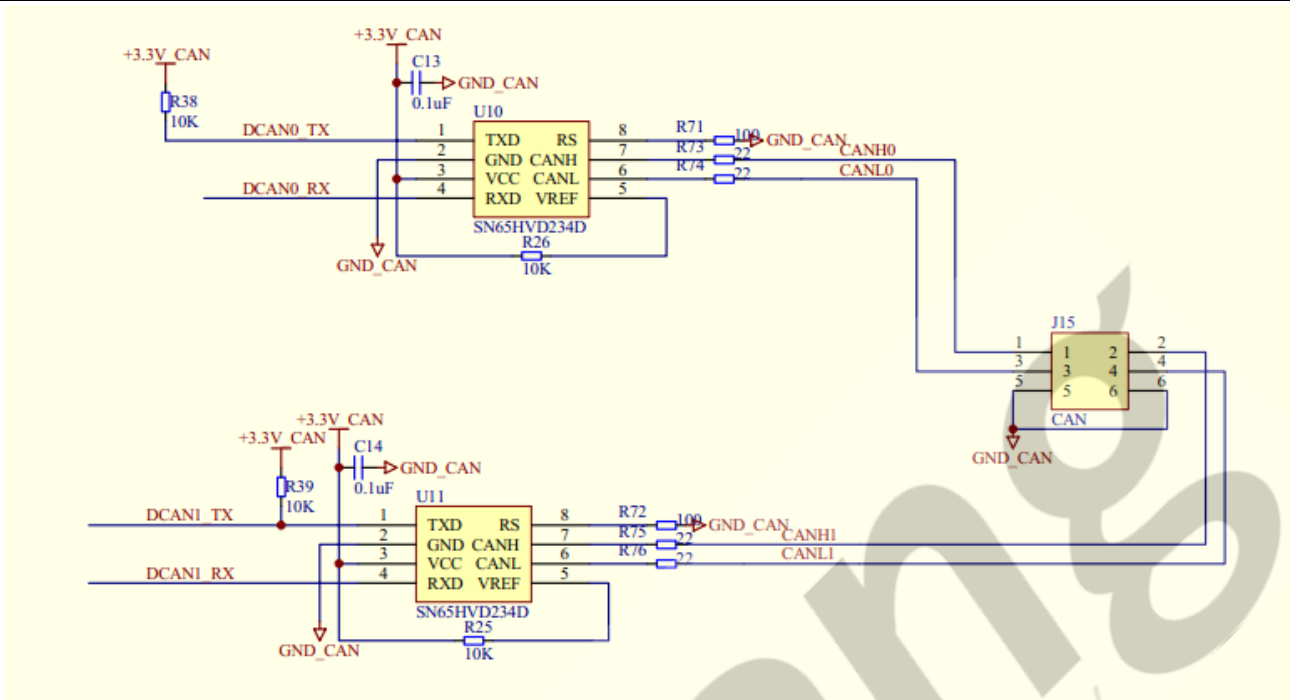
J6 pin definition: ADC Interface (J6), 4-ch is for AD input.

1	AD_IN4
2	AD_IN5
3	AD_IN6
4	AD_IN7

picture 20

5.15 CAN Bus Interface

Expanding board expands 2-ch CAN bus (J15), as shown:

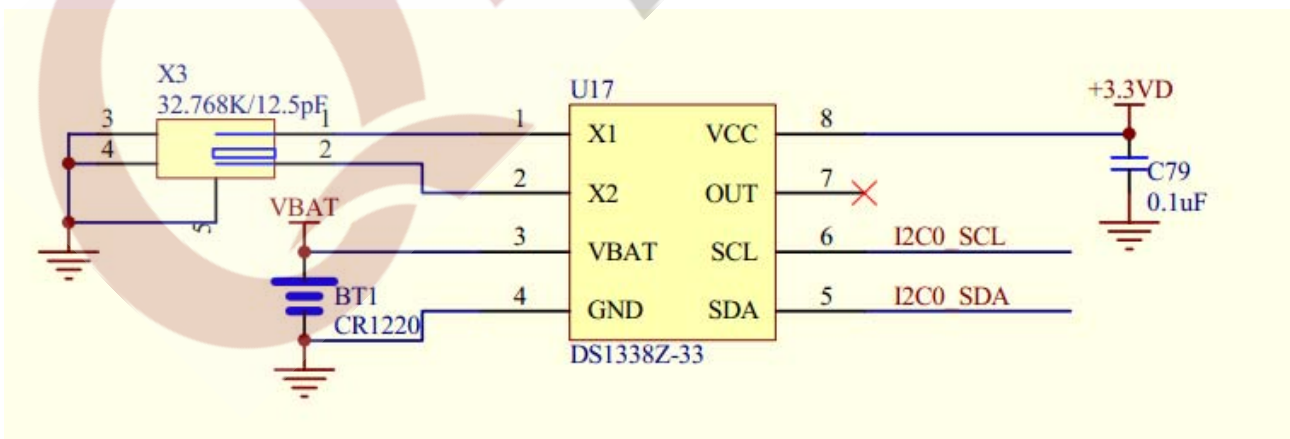


picture 20

Remark: CAN bus support CAN2.0 A & B protocol.

5.16 RTC

IAC-335X-MB expanding board can extend precise clock circuit with 3.3V high capacity button battery.



picture 21

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 IAC-335X-Kit; 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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