



## IAC-IMX6UL-KIT Hardware Manual

Version: 3.0

2017.05

## Version Updates

Ver.	Hardware Platform	Description	Date	Reviser
1.0	IAC-IMX6UL-KIT	First version ,initial release	2015-12-06	st
2.0	IAC-IMX6UL-KIT	Internal Release	2016-06-06	wwx
3.0	IAC-IMX6UL-KIT	Change pictures	2017-05-10	wwx



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**"Notice":** This manual mainly introduce hardware interface of this development board.

## I . Preface

### 1.1 Company Profile

Zhejiang Qiyang Intelligent Technology Co., Ltd. locates 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.

Over the years we focused on the development and services of embedded ARM industrial control products, which provides an easy-to-use development tools, reference design platform, product solutions of volume production for embedded development engineers. It helps customers to shorten the time from embedded board to products, and improves product quality. Our company is dedicated to become a leading embedded hardware and software supplier.

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.

Thanks for using products made by Qiyang Intelligence technology company, we will try our best to offer you technical assistance! Happy working!

## **1.2 Suggestion for Using IAC-IMX6UL-Kit Development Kit**

1. Please read the instructions firstly 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 IAC-IMX6UL-Kit, including the hardware resource allocation, the definition of each pin in core board and baseboard, the definition of expanded pin, 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-IMX6UL Linux User Manual*;

5. IAC-IMX6UL-KIT accept baseboard customization and development service and core board batch order.

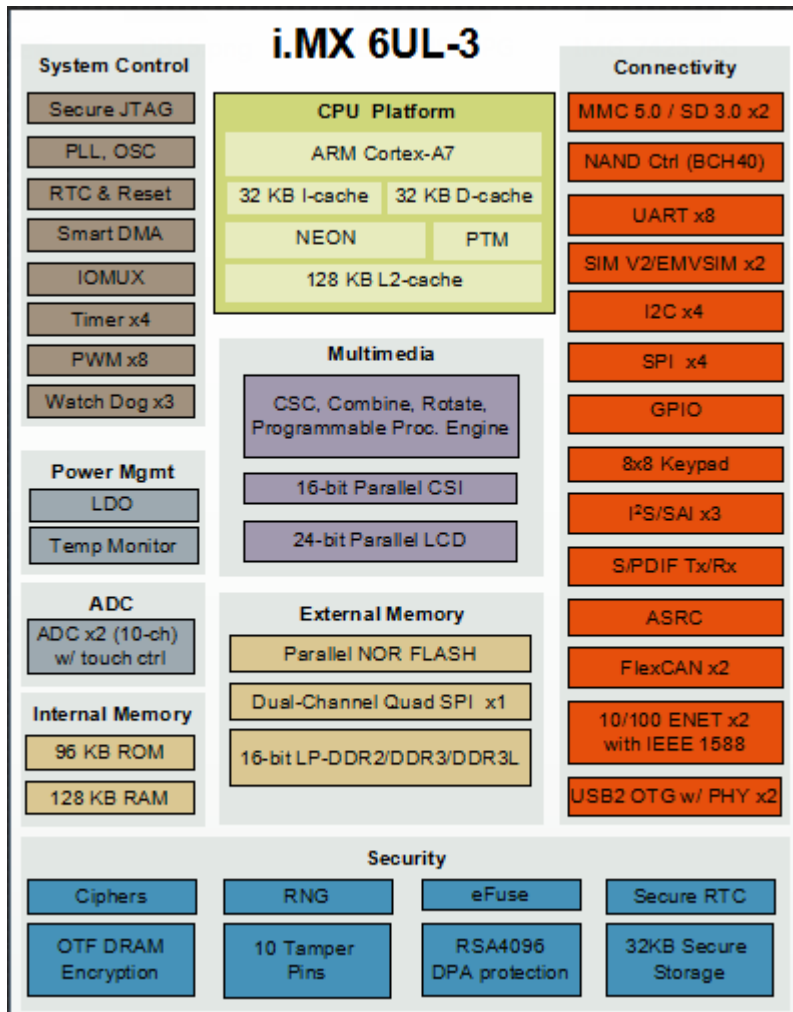
## II . System Composition

### 2. 1 Chip Summary

IAC-IMX6UL-KIT development board/evaluation board, adopts Freescale i.MX6U1traLite processor, users could select from various models of processor chip as needed in order to reduce the cost, this model is only suitable for mass production, Qiyang development/evaluation board's standard configuration is i.MX6 UL-2.

i.MX 6UL is the ARM Cortex-A7 microprocessor which American freescale launched. This processor carries NEON and FPU(Floating Point Unit) coprocessor; It has 32KB L1 command cache and 32KB data cache which is with single fault test(odd even check); has 256KB L2 cache which has function of Error Correction Codeword(ECC). Moreover, i.MX6 UL-2 integrates profuse interface resources. It is suitable for the POS device , vehicle mounted information process, HMI, IOT, etc.

Moreover, i.MX6 UL-2 integrates profuse interface resources, function diagram is as shown:

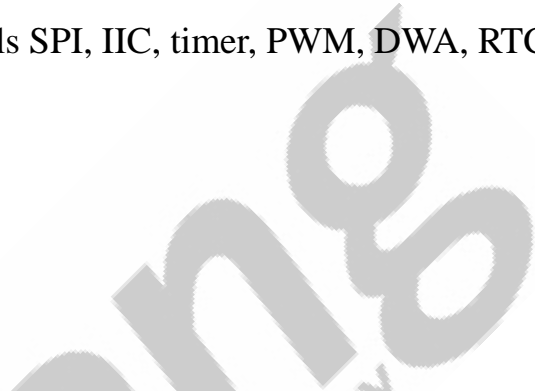


- ◆ ARM Cortex A7 core, 528MHZ;
- ◆ Be with NEON and FPU(Floating Point Unit) coprocessor;
- ◆ Be with 24-bit LCD controller and touch screen controller, the resolution ratio reaches up to 1366\*768;
- ◆ 2-ch USB2.0 be with PHY, it is high speed OTG;
- ◆ 2-CH MMC5.0/SD2.0/SDIO;
- ◆ Supports 8/10/16 -Bit CSI Image Sensor interfaces;



- ◆ Supports 8-CH UART;
- ◆ 2-ch Ethernet port MAC (10/100MHZ);;
- ◆ Up to 2 Controller Area Network(CAN) ports, support CAN2,0 A and B;
- ◆ 3-ch multifunctional audio channels;
- ◆ Common peripherals like Multi-channels SPI, IIC, timer, PWM, DWA, RTC, watchdog, etc.

### i.MX6UL Series Chips



Red indicates change from column to the left

### i.MX 6UltraLite Device Options

Feature	6UL-0	6UL-1	6UL-2	6UL-3
Sub Family	6UL Base	6UL General Purpose 1	6UL General Purpose 2	6UL Security
Core	ARM Cortex-A7	ARM Cortex-A7	ARM Cortex-A7	ARM Cortex-A7
Speed	528 MHz	528 MHz	528 MHz	528 MHz
Cache	32 KB-I, 32KB-D	32 KB-I, 32KB-D	32 KB-I, 32KB-D	32 KB-I, 32KB-D
OCRAM	128 KB	128 KB	128 KB	128 KB
DRAM	16-bit LP-DDR2, DDR3/DDR3L	16-bit LP-DDR2, DDR3/DDR3L	16-bit LP-DDR2, DDR3/DDR3L	16-bit LP-DDR2, DDR3/DDR3L
eFuse for Customer	512-bit	1024-bit	1536-bit	2048-bit
NAND (BCH40)	Yes	Yes	Yes	Yes
Parallel Nor/EBI	Yes	Yes	Yes	Yes
Ethernet	10/100 MB x 1	10/100 MB x 1	10/100 MB x 2	10/100 MB x 2
USB with PHY	OTG, HS/FS x 1	OTG, HS/FS x 2	OTG, HS/FS x 2	OTG, HS/FS x 2
CAN	0	1	2	2
Security	None	TRNG, Crypto Engine (AES/TDES/SHA), Secure Boot	TRNG, Crypto Engine (AES/TDES/SHA), Secure Boot	TRNG, Crypto Engine (AES/TDES/SHA/RSA with DPA), Secure Boot, Tamper Monitor, PCI4.0 pre-certification, OTF DRAM Encryption
Graphic	None	None	PxP	PxP
CSI	None	None	16-bit Parallel CSI	16-bit Parallel CSI
LCD	None	None	24-bit Parallel LCD	24-bit Parallel LCD
QSPI	1	1	1	1
SDIO	2	2	2	2
UART	4	8	8	8
ISO7816-3	0	2	2	2
IIC	2	4	4	4
SPI	2	4	4	4
I2S/SAI	1	3	3	3
S/PDIF	1	1	1	1
Timer/PWM	Timer x2, PWM x4	Timer x4, PWM x8	Timer x4, PWM x8	Timer x4, PWM x8
12-bit ADC	1x8ch	1x8ch	2x8ch	2x8ch
Keyboard (8x8)	Yes	Yes	Yes	Yes
Temperature	0C to 70C (Tj)	-40C to 105C (Tj)	-40C to 105C (Tj)	-40C to 105C (Tj)



## 2.2. Development Board / Evaluation Board Resource

<b>Hardware Resources</b>	<b>Core Board</b>	CPU	freescale i.MX 6UL-2 CPU , ARM Cortex A7, CPU frequency 528MHZ	
		RAM	DDR3 SDRAM, standard configuration is 512MB	
		Flash	4GB EMMC flash	
		System Power	Single 5V power input; It outputs all voltage core board needs	
	<b>Back Plane</b>	<b>Communication Interface</b>		4-ch RS232: Including 1-ch Debug Uart, 1-ch 5-wire Uart, 2-ch 3-wire Uart,
				4-ch USB 2.0 Host, 1-ch USB OTG
				2-ch 19/100Mbps Ethernet port ,standard RJ45 interface, with ACT/LINK indicator.
				1-ch minipcie , with external SIM socket, to connect 3G/4G module.
				2-ch CAN bus interface, with isolation, to support CAN 2.0A and CAN2.0B protocol.
				1-ch RS485 bus interface, with isolation
				8-ch 12 bit ADC
		<b>Display Connector</b>		18-bit TFT-LCD , to support highest resolution 1366*768
				VGA, to connect common displayers.
		<b>Audio Connector</b>		McASP audio interface, binaural output, MIC audio input
		<b>Input Connector</b>		4-wire resistive touch panel interface
		<b>Storage Connector</b>		1-ch TF Interface
		<b>Other Device</b>		Bootup dial switch、Reset circuit、 Watchdog、 RTC、 Buzzer

		Power Input	+12V supply power, the circuit is with diode for depressurization, supports +5.5V~+28V wide range voltage.	
<b>DVD Datasheet</b>	Components Manual		Data sheet of components used in development board	
	Virtual Machine		VMware-workstation-full-9.0.2-1031769	
	ubuntu		ubuntu-12.04-desktop-i386.iso	
	Cross-compiler		gcc-linaro-arm-linux-gnueabi-4.7-2012.12-20121214_linux.tar.bz2	
	Tools Terminal		General terminal debug tools	
	Source Code		Bootloader、 kernel、 fs source code	
	Test Program		Interface application demo test program and test program source code	
	Image File		OS image file	
	User Manual		Development Board User Manual	
	Schematic Diagram		Back Plane PDF schematic diagram	
	PCB Library		Back Plane PCB library	
	Structure Size Picture		Core board and Back Plane	
<b>Electrical Characteristics</b>	Structure and Size	Core Board	55mm*46mm	
		Back Plane	185mm*110mm	
	PCB Specification	Core Board	4-layer board high precision with immersion gold technology	
		Back Plane	4-layer board high precision with immersion gold technology	
	Mainboard Power Consumption		≤2W	
	Operation Temperature		-20°C ~ +70°C (Could be upgraded to industrial level temperature)	

		based on the customers' requirement of customization)
	Humidity	5% ~95%, Non-Condensing

### 2.3. Core Board Resource

IAC-IMX6UL-KIT core board adopts 4-layer PCB high precision technology, and be of the top electrical and anti-jamming performance. It integrates CPU, EMMC, RAM, power, crystal oscillator ,etc, draw up to more than 160 pins, fully expand the hardware resources of i.MX6UL-2, users could combine different interface functions by multiplexing pins and redesign the most personalized baseboard.



Front Side



Back Side

- ◆ Onboard freescale i.MX 6UL-2 CPU, basic frequency: 528MHz;
- ◆ Onboard 512MB DDR3 SDRAM 4GB EMMC Flash ;
- ◆ Core Board Size: 55mm \* 46mm, it can be suitable for many kinds of embedded

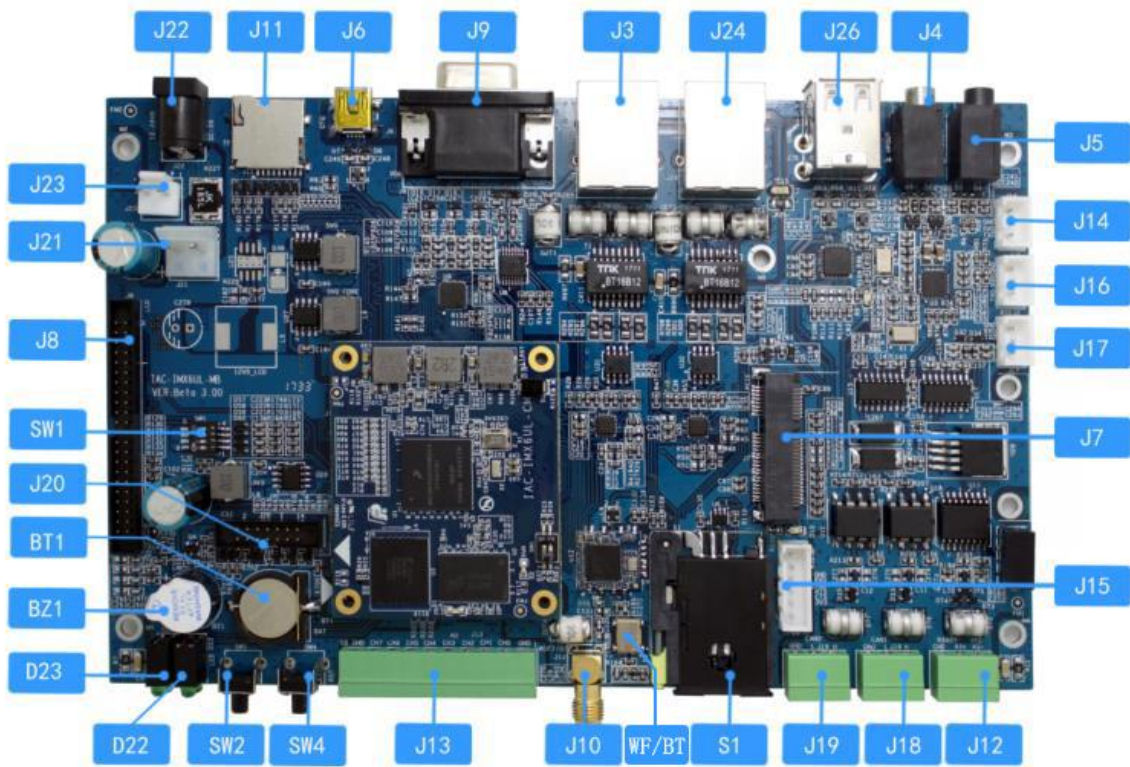
situation;

- ◆ By using 2\*50PIN connectors bring out all signals from Core Board, so it is convenient for users to do hardware pruning and multi-platform using;
- ◆ Power: 5V power supply, really low power consumption, mainboard power < 2W.

#### 2.4. Back Plane Resources

Qiyang has developed standard DEMO baseboard, fully expand all interface resources i.MX6UL-2 supports, users could customize baseboard themselves according to their desire.





Function Instruction:

Item	Functions
J2	100Mbps ethernet
J3	100Mbps ethernet
J4	Binaural audio output port
J5	MIC audio input port
J6	USB OTG, for downloading and debugging.
J7	MINI_PCIE, to connect 3G/4G module
J8	LCD TTL, integrates 4-wire resistive touch panel, integrates PWM.
J9	VGA displayer interface, DB15 female connector.
J11	TF Card

J12	RS485 Bus interface
J13	ADC, 8-ch 12 bit precision
J14	Debug UART
J15	RS232, 5-wire
J16	RS232, 3-wire
J17	RS232, 3-wire
J18	CAN bus interface
J19	CAN bus interface
J20	CSI bus interface
USB1	USB HOST *2
J21	12V input power
J22	+12V power input connector
J23	+12V power input connector
BZ1	Buzzer
SW1	Bootup dial switch
SW2	Button
SW4	Reset button
BT1	System RTC(+3.0V)
WF/BT	WiFi&Bluetooth(BL-R8723BT1), WiFi: 802.11 B/G/N

## 2.5. Pin Definition

### J1 Pin Definition-Core Board Connector

Signal Name	Pin No.	Pin No.	Signal Name
GND	1	2	GND
GND	3	4	GND
GND	5	6	GND

Any question, please send E-mail : [supports@qiyangtech.com](mailto:supports@qiyangtech.com)

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I2C1_SDA	7	8	I2C1_SCL
GND	9	10	GND
I2C2_SDA	11	12	I2C2_SCL
GND	13	14	GND
H_WP_U	15	16	H_WP_W
GND	17	18	GND
CSI_DAT2	19	20	CSI_DAT4
CSI_DAT3	21	22	CSI_DAT5
CSI_DAT6	23	24	CSI_DAT7
GND	25	26	GND
SD1_CMD	27	28	SD1_CLK
SD1_DAT0	29	30	SD1_DAT1
SD1_DAT1	31	32	SD1_DAT3
SD1_DAT4	33	34	GPIO1_19
GND	35	36	GND
KEY1_IN	37	38	KEY1_IN
SPI3_SS0	39	40	SPI3_SCLK
SPI3_MISO	41	42	GND
SPI3_MOSI	43	44	GND
GND	45	46	PWM5_OUT
GND	47	48	GND
BZ_CMD	49	50	LCD_CLK
LCD_HSYNC	51	52	LCD_VSYNC
LCD_DE	53	54	GND
GND	55	56	GND



LCD_DAT0	57	58	LCD_DAT1
LCD_DAT2	59	60	LCD_DAT3
LCD_DAT4	61	62	LCD_DAT5
LCD_DAT6	63	64	LCD_DAT7
GND	65	66	GND
LCD_DAT8	67	68	LCD_DAT9
LCD_DAT10	69	70	LCD_DAT11
LCD_DAT12	71	72	LCD_DAT13
LCD_DAT14	73	74	LCD_DAT15
GND	75	76	GND
LCD_DAT16	77	78	LCD_DAT17
LCD_DAT18	79	80	LCD_DAT19
LCD_DAT20	81	82	LCD_DAT21
LCD_DAT22	83	84	LCD_DAT23
GND	85	86	GND
ENET2_RXER	87	88	ENET2_TX_CLK
GND	89	90	GND
ENET2_EXD0	91	92	ENET2_TXEN
ENET2_RXD1	93	94	ENET2_TXD0
ENET2_CRS_DV	95	96	ENET2_TXD1
GND	97	98	GND
GND	99	100	GND

### J2 Pin Definition -Core Board Interface

Signal Name	Pin No.	Pin No.	Signal Name
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GND	1	2	GND
GND	3	4	GND
GND	5	6	GND
SYS_RST	7	8	NC
GND	9	10	RUN_LED
RST_CMD	11	12	WDI_CMD
PCIE_RST	13	14	PCIE_DISEN
GND	15	16	ENET1_INT
EMMC_LED	17	18	ENET2_INT
ENET_RST	19	20	GND
ERROR_LED	21	22	LCD_PW_EN
5V0_OTG2	23	24	5V0_OTG1
GND	25	26	GND
GPIO1_IO2	27	28	USB_OTG1_ID
GPIO1_IO3	29	30	GPIO1_IO1
GND	31	32	GND
USB_OTG2_DP	33	34	GPIO1_IO4
USB_OTG2_DN	35	36	GND
GND	37	38	USB_OTG1_DP
GND	39	40	USB_OTG1_DN
GND	41	42	GND
JTAG_TCK	43	44	GND
JTAG_TDO	45	46	JTAG_TMS
JTAG_nTRST	47	48	AUD_RST
GND	49	50	JTAG_ADI

TP1	51	52	GND
TP2	53	54	UART1_TXD
GND	55	56	UART1_RXD
CAN2_TXD	57	58	UART2_TXD
CAN2_RXD	59	60	UART2_RXD
GND	61	62	UART3_TXD
CAN1_TXD	63	64	UART3_RXD
CAN1_RXD	65	66	UART4_TXD
GND	67	68	UART4_RXD
UART5_CTS	69	70	UART5_TXD
UART5_RTS	71	72	UART5_RXD
GND	73	74	GND
ENET_MDIO	75	76	ENET_MDC
GND	77	78	GND
ENET1_TXEN	79	80	ENET1_RXER
ENET1_TX_CLK	81	82	ENET1_RXD0
ENET1_TXD0	83	84	ENET1_RXD1
ENET_TXD1	85	86	ENET1_CRS_DV
GND	87	88	GND
GND	89	90	GND
5V0_CORE	91	92	5V0_CORE
5V0_CORE	93	94	5V0_CORE
5V0_CORE	95	96	5V0_CORE
5V0_CORE	97	98	5V0_CORE
5V0_CORE	99	100	5V0_CORE

**J7 Pin Definition -MINI\_PCIE Interface**

Signal Name	Pin No.	Pin No.	Signal Name
NC	1	2	3V3_PCIE
NC	3	4	GND
NC	5	6	1V5_PCIE
NC	7	8	SIM_VDD
GND	9	10	SIM_DATA
NC	11	12	SIM_CLK
NC	13	14	SIM_RST
GND	15	16	NC
NC	17	18	GND
NC	19	20	PCIE_DISEN
GND	21	22	PCIE_RST
NC	23	24	3V3_PCIE
NC	25	26	GND
GND	27	28	1V5_PCIE
GND	29	30	I2C1_SCL
NC	31	32	I2C1_SDA
NC	33	34	GND
GND	35	36	PCIE_DN
GND	37	38	PCIE_DP
3V3_PCIE	39	40	GND
3V3_PCIE	41	42	3V3_PCIE
GND	43	44	3V3_PCIE
NC	45	46	3V3_PCIE
NC	47	48	3V3_PCIE

NC	49	50	GND
NC	51	52	3V3_PCIE

**J8 Pin Definition-LCD Interface**

Signal Name	Pin No.	Pin No.	Signal Name
GND	1	2	LCD_CLK
LCD_HSYNC	3	4	LCD_VSYNC
GND	5	6	LCD_DAT18
LCD_DAT19	7	8	LCD_DAT20
LCD_DAT21	9	10	LCD_DAT22
LCD_DAT23	11	12	GND
LCD_DAT10	13	14	LCD_DAT11
LCD_DAT12	15	16	LCD_DAT13
LCD_DAT14	17	18	LCD_DAT15
GND	19	20	LCD_DAT2
LCD_DAT3	21	22	LCD_DAT4
LCD_DAT5	23	24	LCD_DAT6
LCD_DAT7	25	26	GND
LCD_DE	27	28	VDD_LCD
VDD_LCD	29	30	3V3
Pull Down	31	32	GND
BLT_PWM	33	34	NC
GND	35	36	GND
I2C2_SDA	37	38	CTH_RST
I2C2_SCL	39	40	CTH_RST
TSC_XP	41	42	TSC_YP

TSC_XM	43	44	TSC_YM
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### J12 Pin Definition-RS485 Interface

Pin No.	Signal Name
1	A1+
2	A1-
3	GND_ISO

### J13 Pin Definition-ADC Interface

Pin No.	Signal Name
1	GND
2	CH0
3	CH1
4	CH2
5	CH3
6	CH4
7	CH5
8	CH6
9	CH7
10	GND

### J14 Pin Definition-Debug UART

Pin No.	Signal Name
1	COM1_TXD
2	COM1_RXD
3	GND

**J15 Pin Definition -RS232 UART**

Pin No.	Signal Name
1	3V3
2	COM5_CTS
3	COM5_RTS
4	COM5_RXD
5	COM5_TXD
6	GND

**J16 Pin Definition-RS232**

Pin No.	Signal Name
1	COM3_TXD
2	COM3_RXD
3	GND

**J17 Pin Definition -RS232**

Pin No.	Signal Name
1	COM2_TXD
2	COM2_RXD
3	GND

**J18 Pin Definition -CAN interface**

Pin No.	Signal Name
1	CAN1H
2	CAN1L
3	GND



**J19 Pin Definition- CAN Interface**

Pin No.	Signal Name
1	DEBUG_TX
2	DEBUG_RX
3	GND

**J20 Pin Definition-CSI Interface**

Signal Name	Pin No.	Pin No.	Signal Name
3V3	1	2	GND
CSI_DAT2	3	4	CSI_DAT3
CSI_DAT4	5	6	CSI_DAT5
CSI_DAT6	7	8	CSI_DAT7
GND	9	10	GPIO1_19
I2C1_SCL	11	12	PWM5_OUT
I2C1_SDA	13	14	GND

## 2.6. Dial Switch

**Core Board Switch (SW1)**

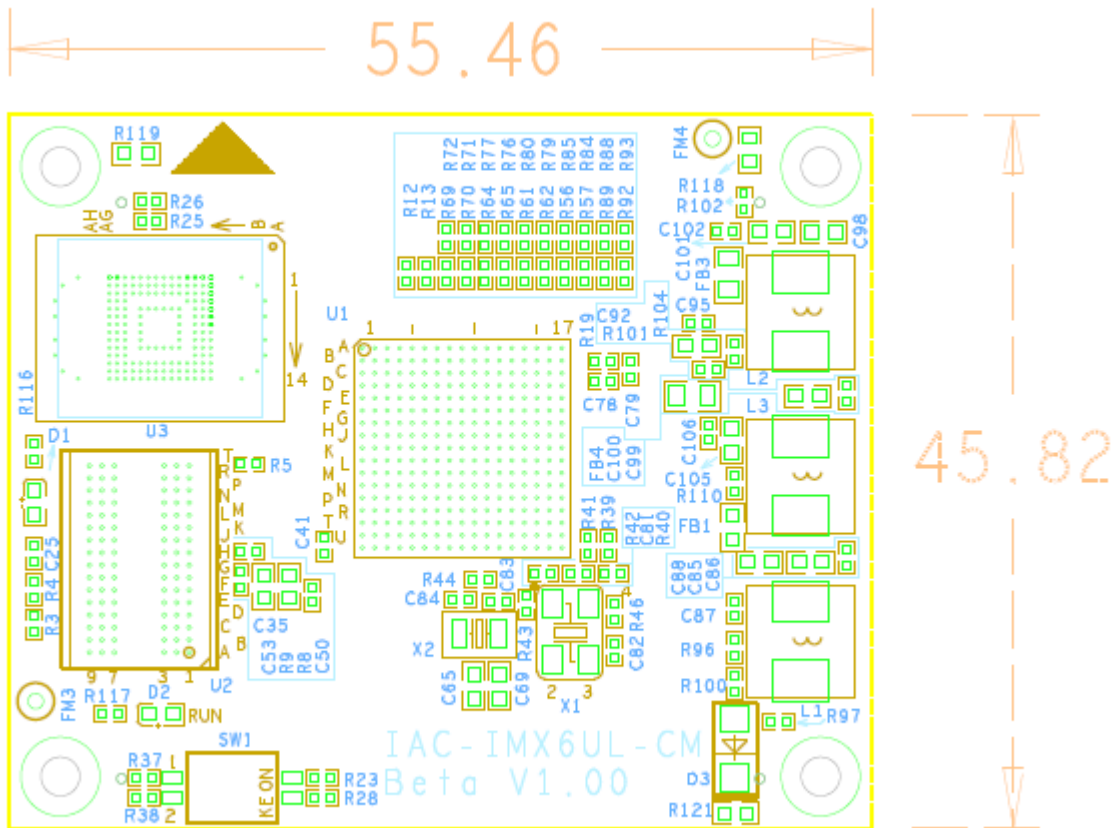
BOOT DEVICE	Burning		Bootup	
SD	1	0	0	1
EMMC	0	1	1	0

**Back Plane Switch (SW1)**

BOOT DEVICE	Switch1	Switch2	Switch3	Switch4
SD	0	0	0	0
EMMC	1	1	0	0

### III. Size & Structure Chart

#### 3.1. Core Board Size:





#### IV.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-IMX6UL-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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