EX-9686U/A-L(A9)
Hardware User Manual

Release Notes

Version	Release Date	Notes
1.00	November, 2013	Initial Release
2.00	January, 2014	The 2nd release

Disclaimer

This documentation is provided for use with TOPSCCC Technology CO., LTD products. No license to TOPSCCC Technology CO., LTD property rights is granted. TOPSCCC Technology CO., LTD assumes no liability and provides no warranty either expressed or implied relating to the usage or intellectual property right infringement that may result from its use.

TOPSCCC provides this document “as is,” without warranty of any kind, expressed or implied, including, but not limited to, its particular purpose. TOPSCCC Technology CO., LTD may make changes to this document without notice.

Table of Contents

TABLE OF CONTENTS 3

1 PRECAUTIONS 4

1.1 Safety Precautions 4
1.2 Write Prohibited Regions 5
1.3 Warranty 5

2 PRODUCT FEATURES 6

2.1 Overview 6
2.2 Features and Specifications 7

3 INTERFACE SPECIFICATIONS 8

3.1 MicroSD Connector 10
3.2 UART Connectors & Debug Port 11
3.3 USB Connectors 14
3.4 Audio Interface 16
3.5 Ethernet Interface 18
3.6 Power Supply (DC-IN connector) 19
3.7 GPIO Pin Header 20
3.8 BM Connector 22
3.9 Parallel Display Interface 23
3.10 Touch Screen Interface 25
3.11 LED 26
3.12 Reset Switch 27
3.13 Expansion Connector 28
3.14 EEPROM 30
3.15 RTC (Real Time Clock) 31

APPENDIX A: BOX HEADER TO DB9 CABLE 32

APPENDIX B: 5-INCH LCD BRIEF (WVGA) 33

APPENDIX C: METAL FRAME OUTLINE DRAWING 34

1 Precautions

1.1 Safety Precautions

In order to use this product safely, please take special note of the following precautions.

- Read all product manuals and related documentation before using this product. Use this product correctly and safely. Follow all warnings.
- If operating or extending this product in a manner not described in this manual, please do so at your own risk. Be sure to fully read this manual and other technical information on our website and proceed safely and responsibly.
- Do not install this product in a place with a lot of water, moisture, dust or soot. This could cause product failure, fire, or an electric shock.
- Some parts of this product generate heat and can reach high temperatures. This may cause burns if it is improperly handled. Do not touch the electronic components or surrounding area while powered on or immediately after being turned off.
- Carry out any design and development only after you have thoroughly read and understood this manual and any other related technical materials on the website or in the data sheets. Test your product thoroughly for reliability and safety.
- This product is not intended for applications that require extremely high reliability, safety, functionality and accuracy: including but not limited to medical equipment, traffic control systems, combustion control systems, and safety equipment. This company is not liable for death or injury if used in such systems.
- This product uses semiconductor components designed for generic electronics equipment such as office automation, communications, measurement equipment and machine tools. Foreign noise or a power surge may cause this product to malfunction or fail.
- To ensure there is no risk of bodily harm or property damage, be sure to take all electrical safety precautions such as protection circuits, limit switches, fuse breakers, or redundant systems. Only use the device after sufficient reliability and safety measures are in place.

1.2 Write Prohibited Regions

Data stored by the EEPROM, i.MX6Q/D electrical fuse (e-Fuse) is used by the software contained in this product. Do not write to these regions as this may cause the product stop working correctly. Purposely writing to these regions voids the product warranty.

1.3 Warranty

As described in the Product Warranty Policy provided with this product, the main board is covered by a one year replacement warranty starting from the time of purchase. Please note that the other included goods and software are not covered under this warranty. Some knowledge used by TOPSCCC Technology CO., LTD is provided by third parties, and TOPSCCC Technology CO., LTD. makes no representation or warranty as to the accuracy of such information.

2 Product Features

2.1 Overview

The EX-9686U/A-L(A9) is a Freescale iMX6 ARM Cortex-A9 based embedded for Gigabit Ethernet ; Micro SD card socket ; USB 2.0 host connector x2 ; USB 2.0 OTG connector x1 ; RS232 x1 and RS485x1 ; GPIO (8-bit) ; IEEE 802.11 b/g/n Wi-Fi x 1(Optional) . It is a flexible, high performance and inexpensive platform designed for embedded applications such as communication/ home/ building/ factory automation.

Each device can be installed in advance with Windows Embedded Compact 7, Ubuntu 11.10 or Android 4.2 for immediate evaluation.

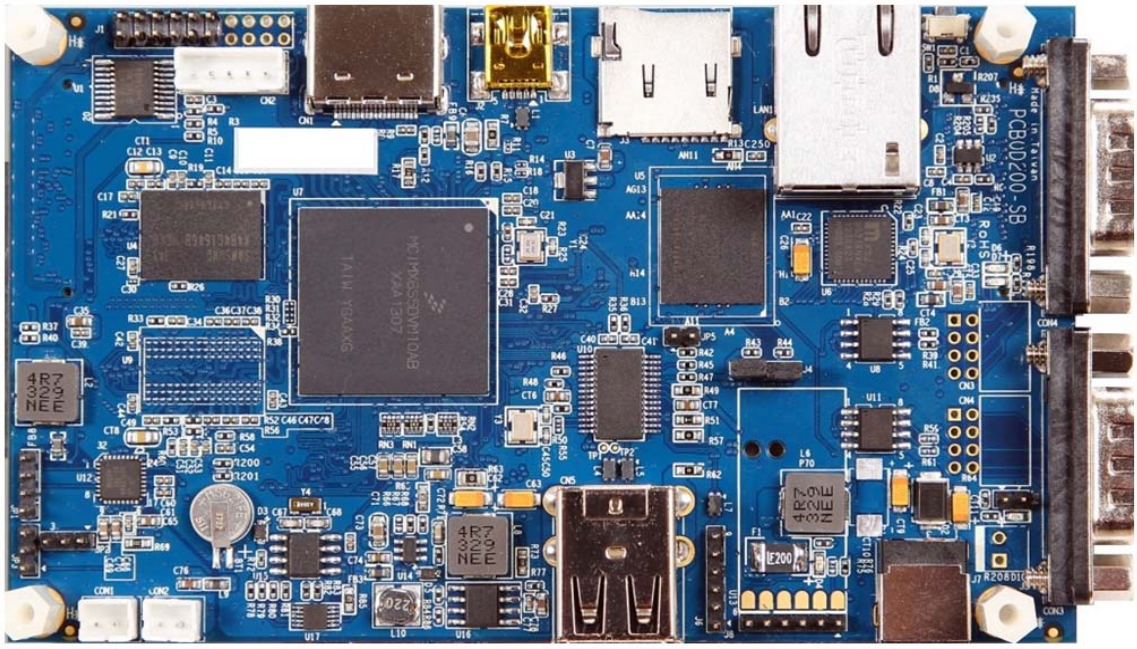
2.2 Features and Specifications

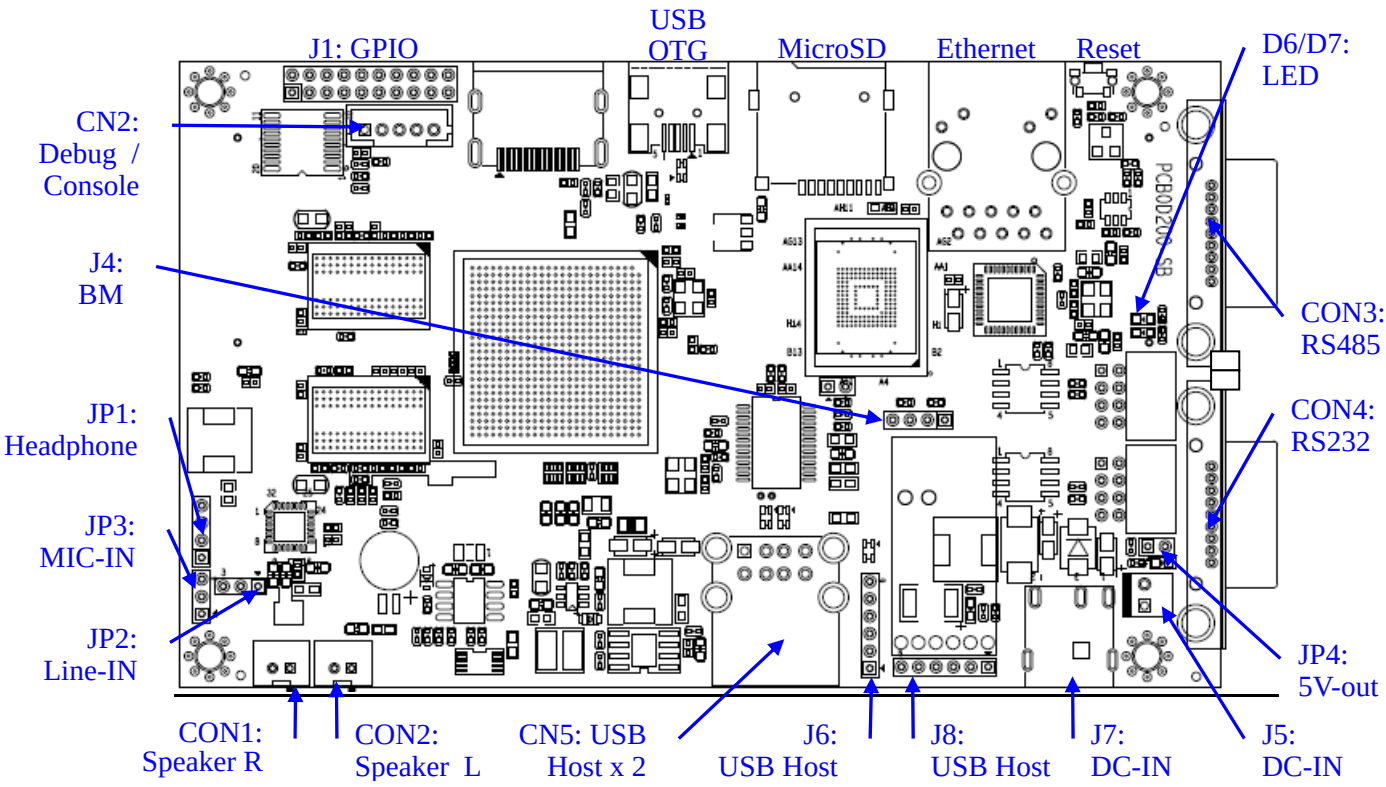
- Freescale iMX6 ARM Cortex™-A9 single core @ 1 GHz (iMX6 Solo)
- 1GB DDR3 SDRAM
- 4GB eMMC Flash
- Hardware Video Decoder Support
- 10/100/1000 Mbps Gigabit Ethernet interface RJ-45 connector x1
- Single parallel 24-bit display port(TTL LCD) x1(Internal)
- Resistive/ Capacitive touch port x1(Internal)
- +5V DC power input connector x1
- USB 2.0 host connector x2
- USB 2.0 OTG connector x1
- Micro SD card socket x1
- SGTL5000 Audio Codec , Amplifier circuit
- MIC-in connector x1(Internal), Earphone connector x1(internal)
- Speaker connector x2 (L/R)
- DB9 connector x2 (RS232 x1 and RS485x1)
- Debug (Console) Port: 8-pin header x1 (**optional debug cable is required**)
- GPIO (8-bit) pin header x1(Internal)
- IEEE 802.11 b/g/n Wi-Fi x 1 **(Optional)**
- PCB Dimension: 72mm x 120mm

3 Interface Specifications

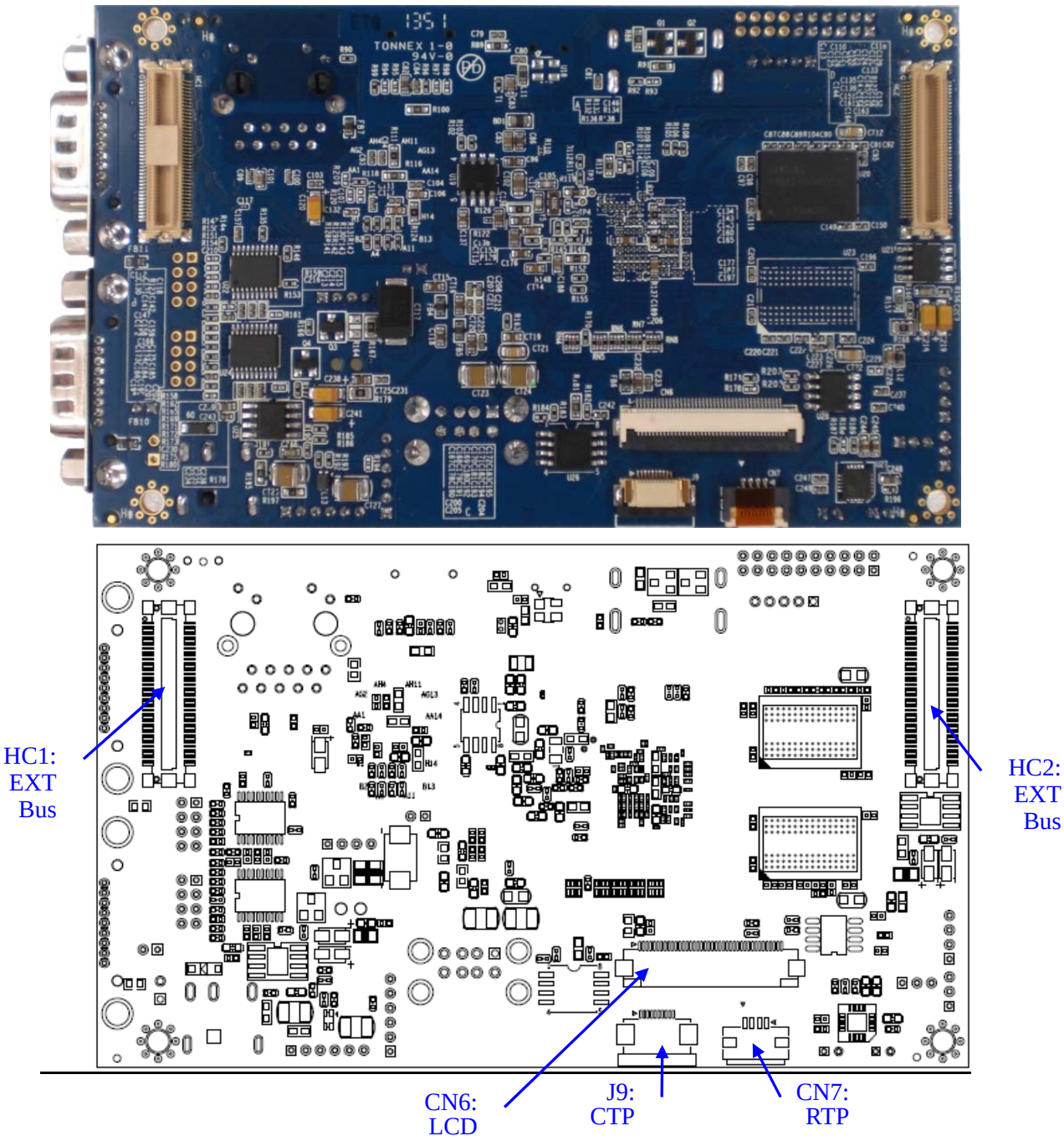
The following photos show connector positions on the EX-9686U/A-L(A9) product. The functional details of the connectors are described in subsequent sections.

PCB Top View





PCB Bottom View



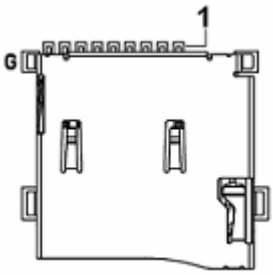
3.1 MicroSD Connector

The microSD host connector has the following specification:

- SD Host Controller Standard Specification version 3.0
- MMC System Specification version 4.2/4.3/4.4
- SD Memory Card Specification version 3.0 and supports the Extended Capacity SD Memory Card
- SDIO Card Specification version 3.0

microSD Connector Pin-out

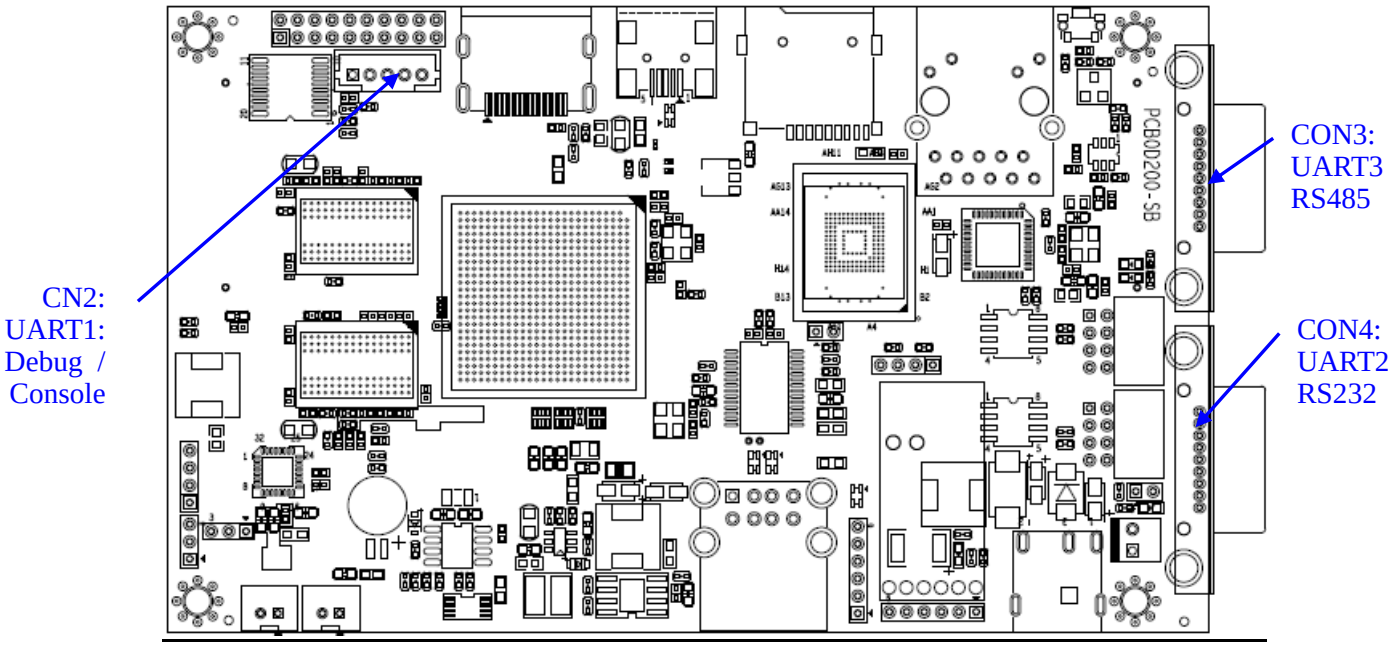
Pin	Signal	Pin	Signal
1	Data 2	6	GND
2	Data 3	7	Data 0
3	CMD	8	Data 1
4	VDD	9	CD
5	CLK		



3.2 UART Connectors & Debug Port

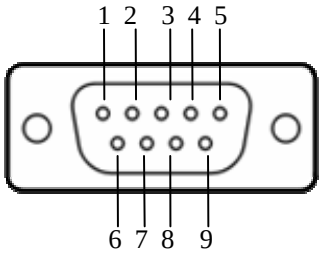
There are 3 UART ports on this device. The connector type and functions are described in the table below:

UART Number	Connector Type	Available Signals	Notes
UART1	1x5 header (CN2)	CMOS signal level (TX, RX)	Console/Debug port. A separate debug cable is required.
UART2	DB9 (CON4)	RS232 signal level (TX, RX, RTS, CTS)	RS232 port
UART3	DB9 (CON3)	RS485 signal level (485+, 485-)	RS485 port **Note: RS485 port works only in HALF Duplex mode**

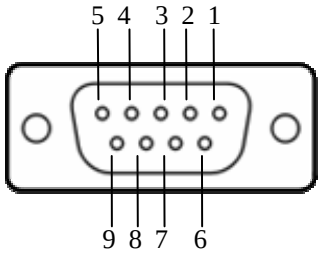


DB9 Pin	2x4 header	RS232	RS485
1	--	---	---
2	4	RxD	485+
3	6	TxD	485-
4	1	---	---
5	5	GND	GND
6	7	---	---
7	8	RTS	---
8	2	CTS	---
9	--	---	---

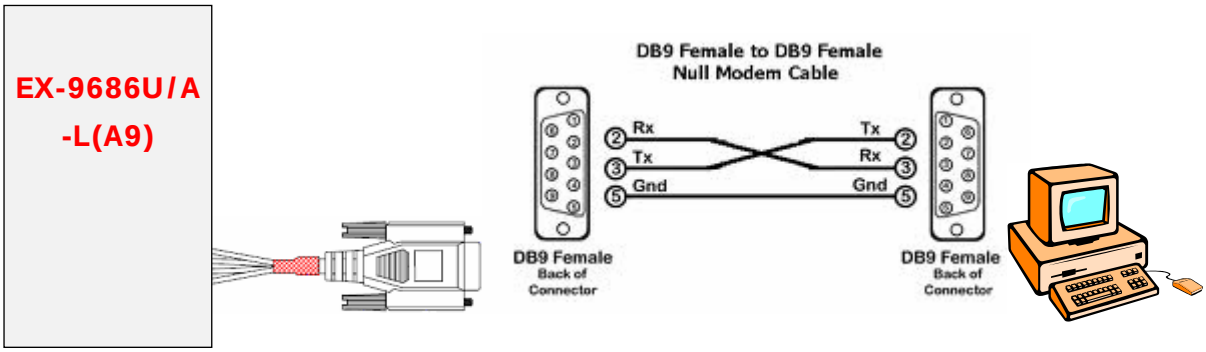
DB9 Male Connector



DB9 Female Connector



UART1 Connection Diagram:

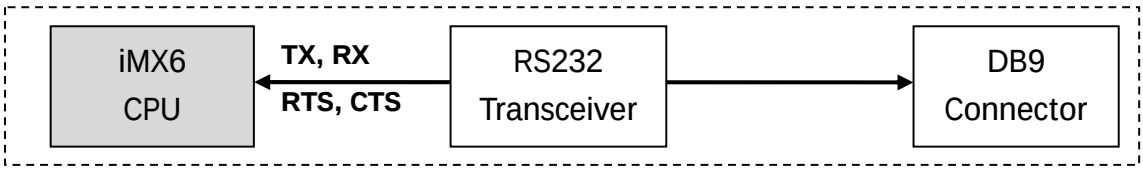


UART1 is dedicated as the debug or console port. The default communication settings are Baud Rate 115200, 8 data bits, no parity, 1 stop bit and no flow control.

Note that UART1 is at CMOS signal level. There is no RS232 transceiver on the port. A separate debug cable is required to connect UART1 to a PC terminal.

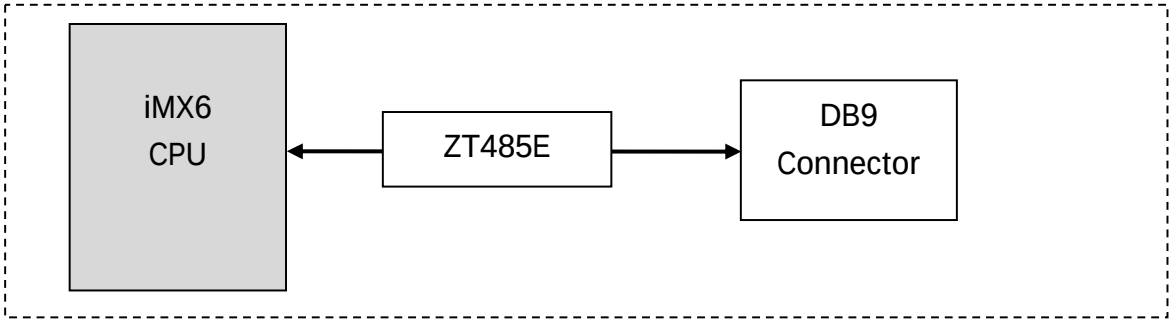
A DB9 **null modem cable** (or adapter) is required when you want to connect UART1 to a PC with terminal emulation software such as TeraTerm.

UART2 Block Diagram:



UART2 (with TX, RX, RTS, CTS signals) works as a regular RS232 port.

UART3 Connection Diagram:



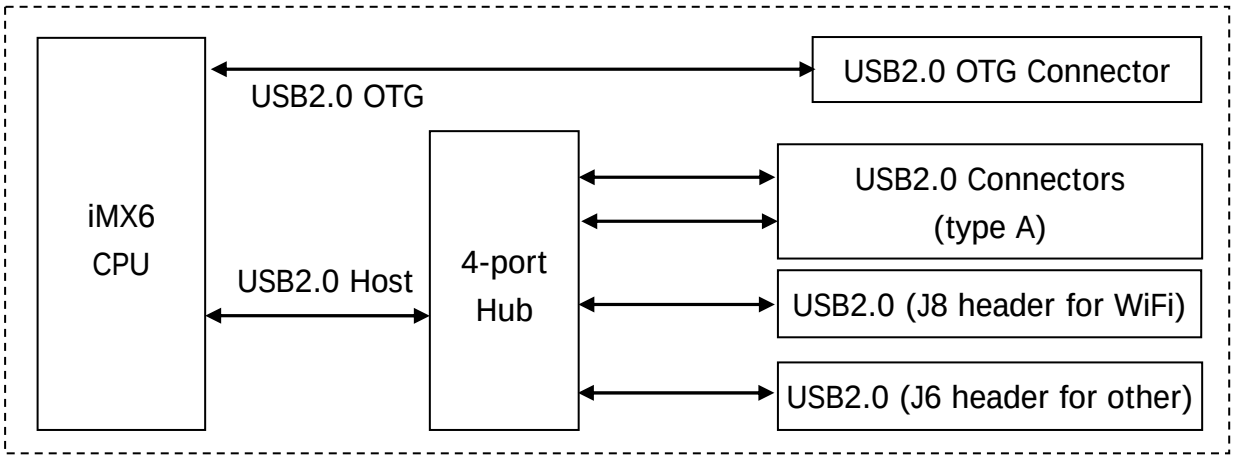
ZT485E: RS485 transceiver. RS485 works in half duplex mode.

3.3 USB Connectors

The USB interfaces on EX-9686U/A-L(A9) include a USB 2.0 OTG port and four USB2.0 host ports. Speed of up to 480 Mbps supported.

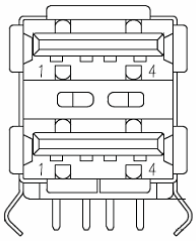
The USB 2.0 host interface is connected to a hub controller to extend host ports. Two of the USB2.0 hub ports are available in type A connectors for users. The other two USB ports are available in pin-headers reserved for WiFi module or other devices.

USB Port:

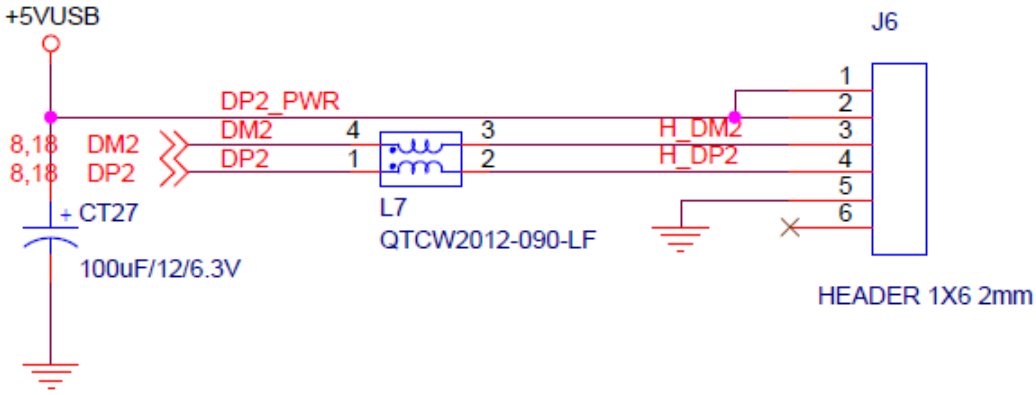


NOTE: The USB 2.0 OTG can be used in host mode or device mode. If you would like to use it in host mode, a separate OTG-to-host cable is required.

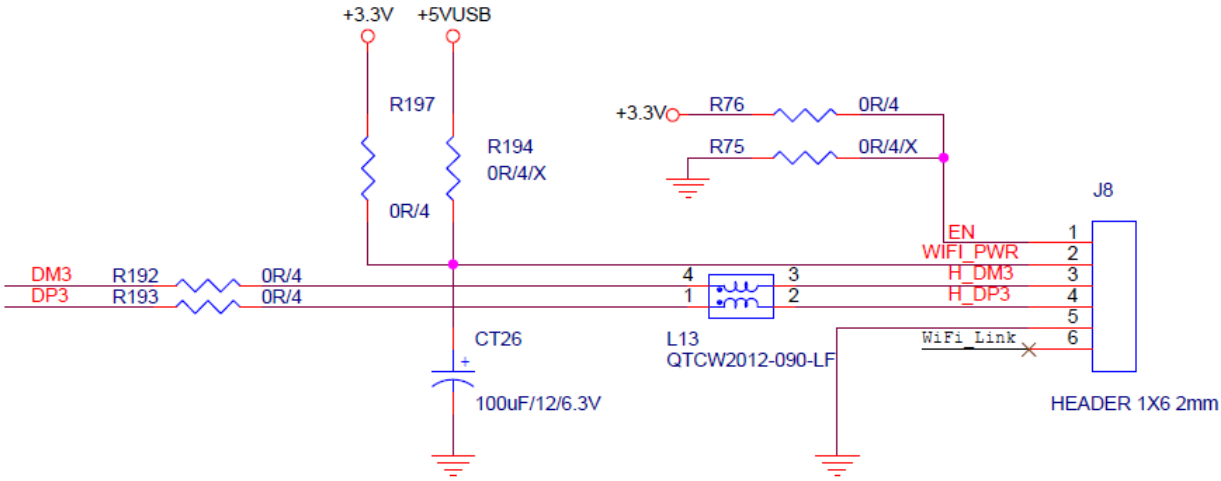
The USB 2.0 host connector is a regular USB type A connector that can be connected to +5V USB storage device. This port is mainly used to connect to USB flash drive.

Pin	Signal	Pin	Signal
1	5V	1	5V
2	Data -	2	Data -
3	Data +	3	Data +
4	GND	4	ID
		5	GND
			

USB port 2 is connected to J6 pin header.



USB port 3 is connected to J8 pin header and is reserved for 802.11b/g/n WiFi module.

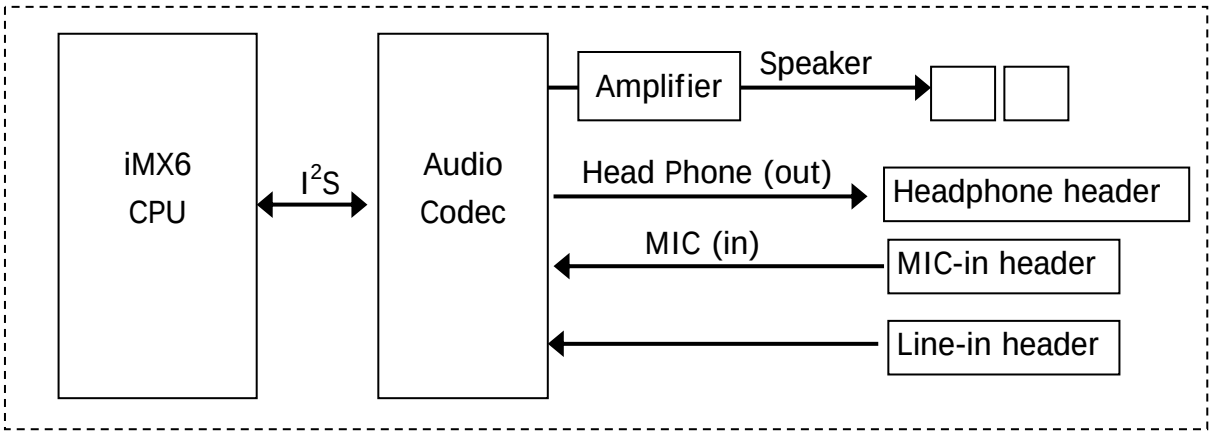


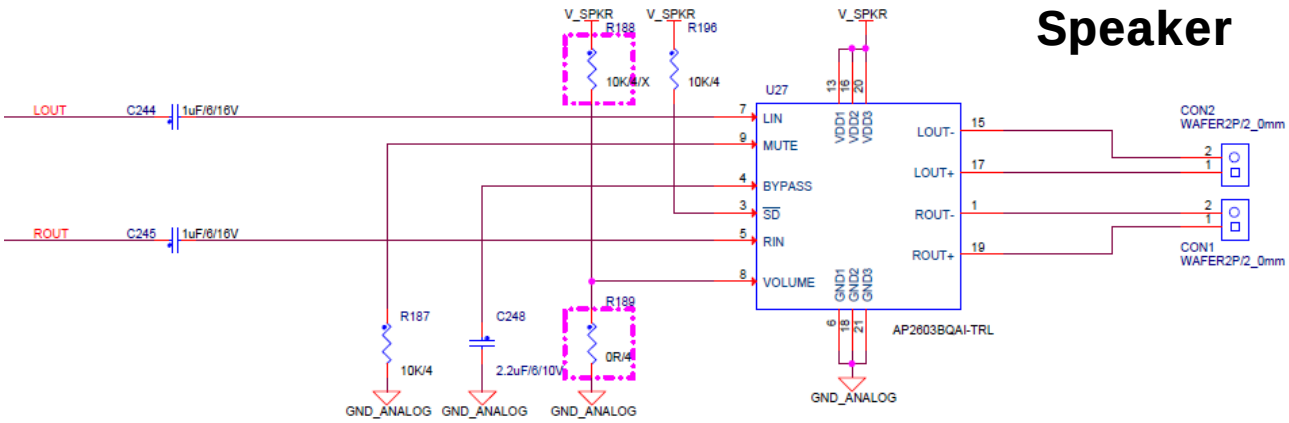
3.4 Audio Interface

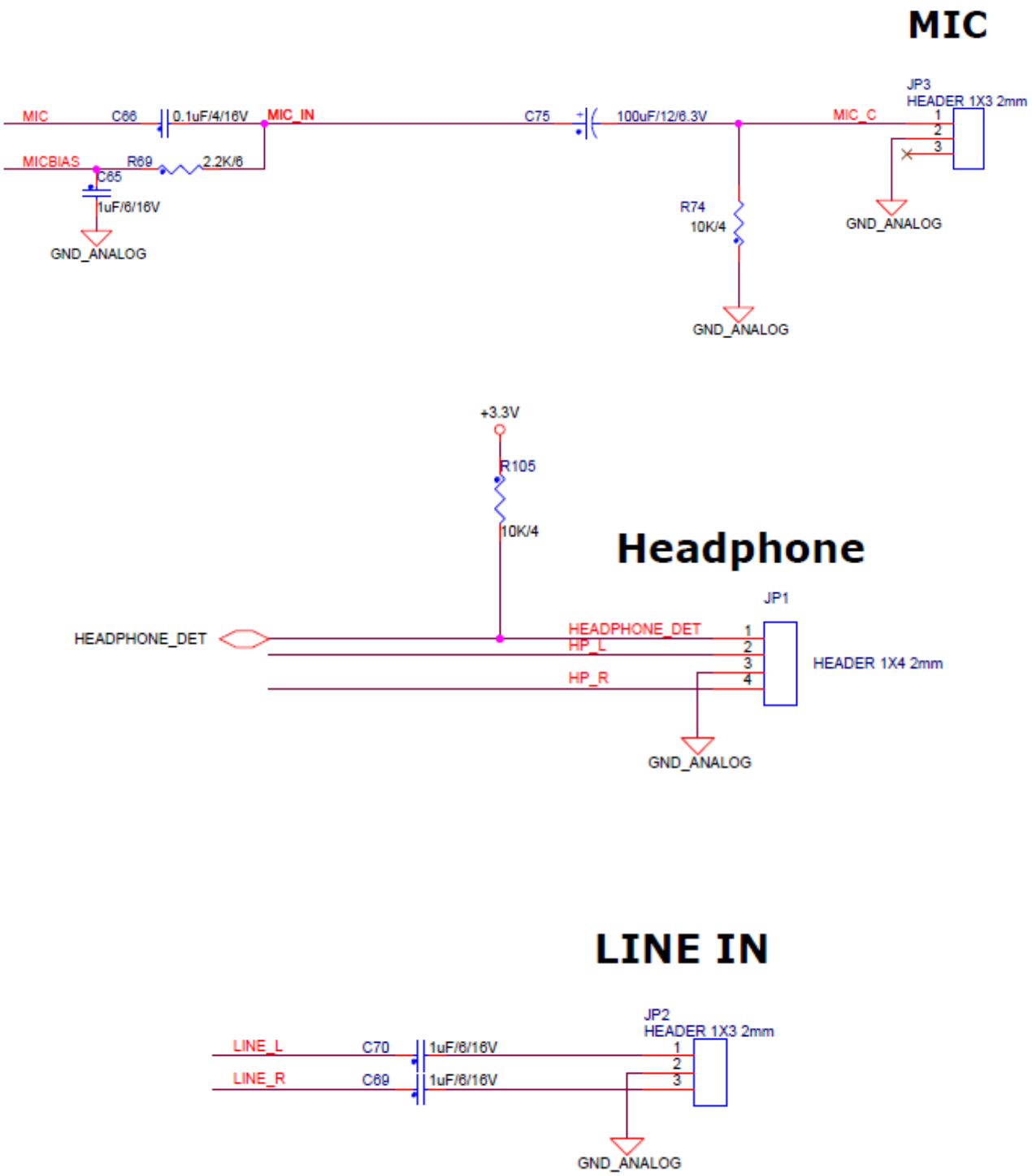
The audio interface is implemented by a SGTL5000 audio codec. The data and control interface between CPU and SGTL5000 is I^2S.

Connector Number	Part Description
CON1	Speaker Right
CON2	Speaker Left
JP3	MIC-IN
JP1	Headphone Out
JP2	Line-IN

Audio Interfaces:



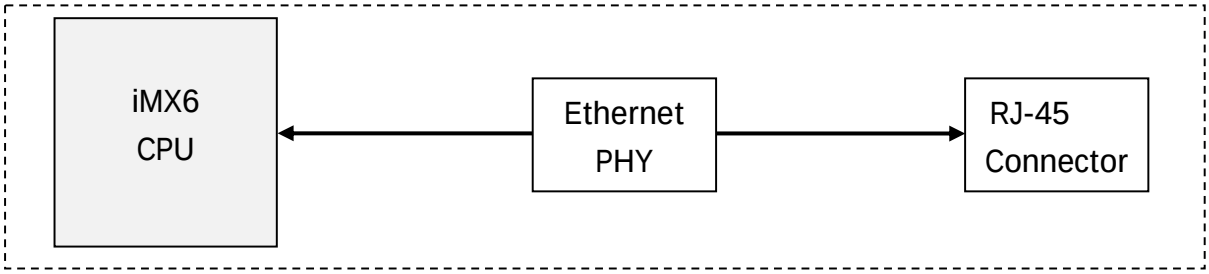



MIC
MIC
C66
0.1uF/4/16V
MIC_IN
C75
100uF/12/6.3V
MIC_C
JP3
HEADER 1X3 2mm
1
2
3
MICBIAS
R69
2.2K/6
C65
1uF/6/16V
GND_ANALOG
R74
10K/4
GND_ANALOG
GND_ANALOG
+3.3V
R105
10K/4
Headphone
JP1
HEADPHONE_DET
HEADPHONE_DET
HP_L
HP_R
1
2
3
4
HEADER 1X4 2mm
GND_ANALOG
LINE IN
JP2
HEADER 1X3 2mm
LINE_L
C70
1uF/6/16V
LINE_R
C69
1uF/6/16V
1
2
3
GND_ANALOG

3.5 Ethernet Interface

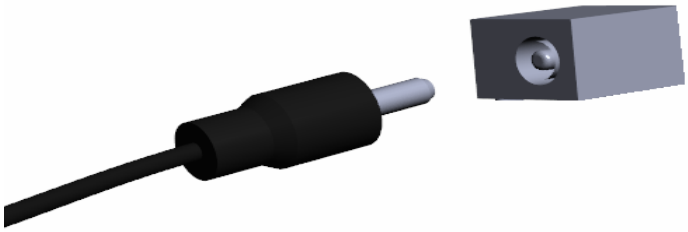
The 10/100/1000 Mbps Gigabit Ethernet interface is available with a standard RJ-45 connector.

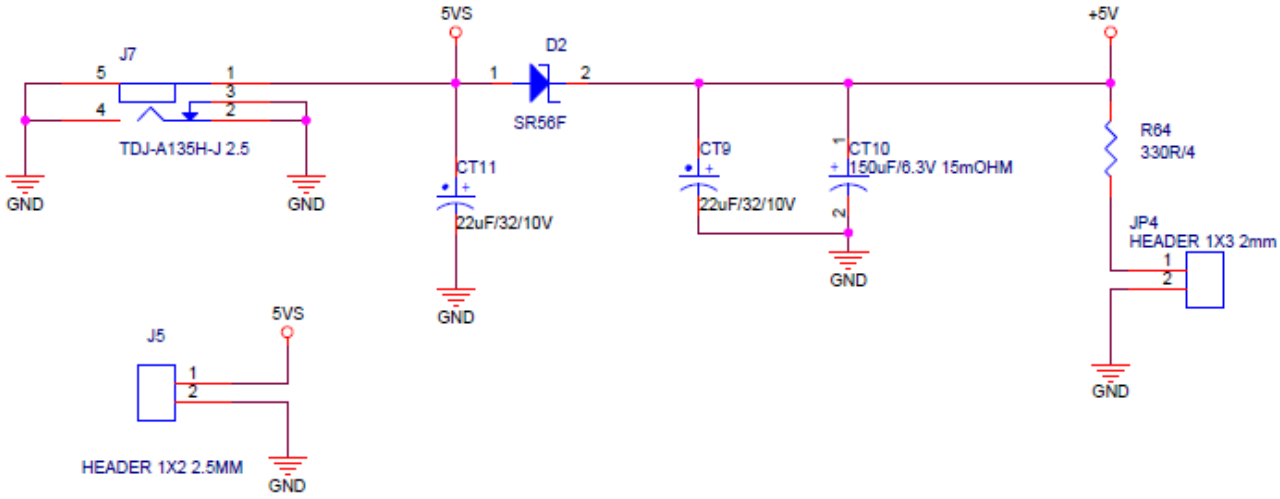
Ethernet:



3.6 Power Supply (DC-IN connector)

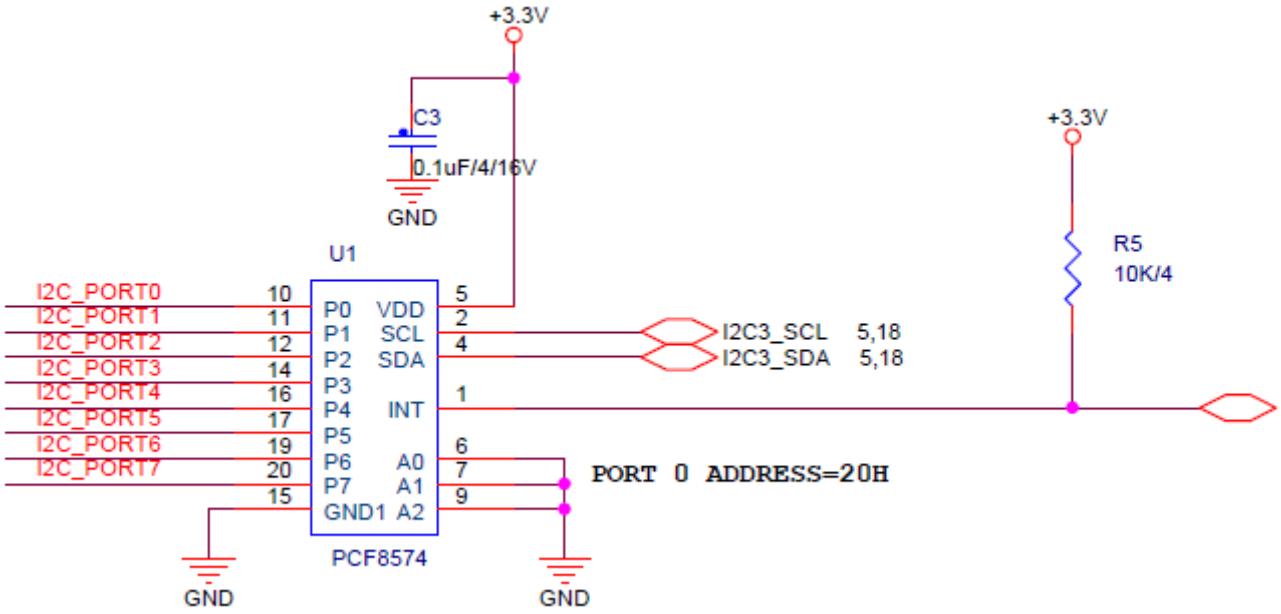
+5V Power input can be applied to the J7 DC jack or to the 2-pin header J5.
The JP4 header can be connected to an LED as the indicator of power input.

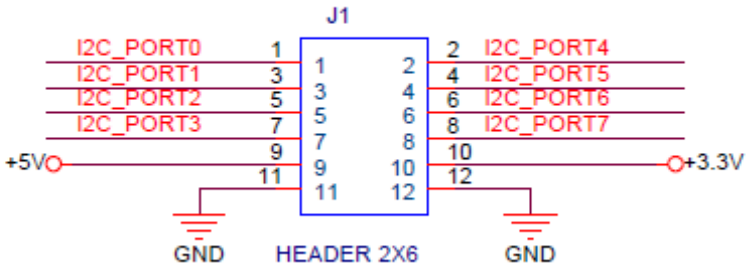


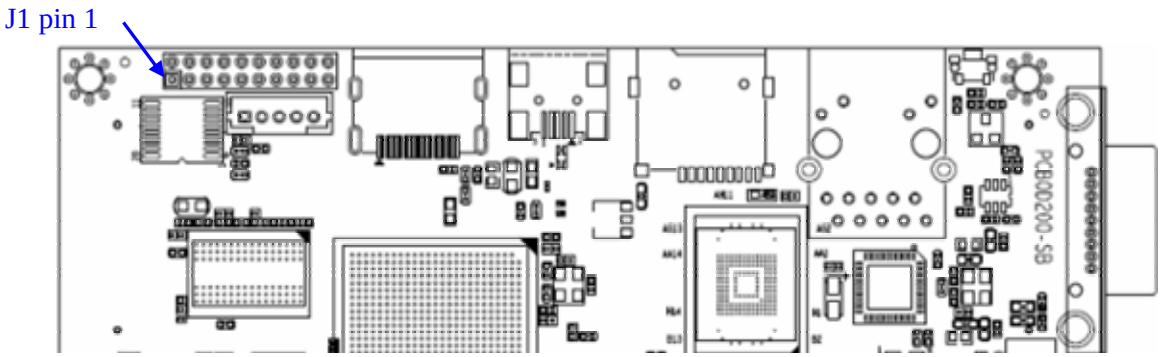


3.7 GPIO Pin Header

The GPIO pin header provides user to connect up to 8 GPIO devices (+3.3V signal level). The GPIO pins are available on J1 pin header.







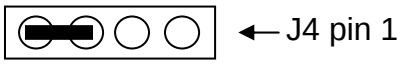
GPIO pin assignment:

J1 pin #	1	3	5	7
GPIO #	224	225	226	227
J1 pin #	2	4	6	8
GPIO #	228	229	230	231

For more information about programming GPIO, please refer to a separate document: “Application Note GPIO”.

3.8 BM Connector

The J4 connector is used to select the operation mode: Normal Operation mode or Firmware Download mode. For more information about Firmware Download mode (to burn firmware image), please refer to “Firmware Image Download” application note.



Firmware Download:

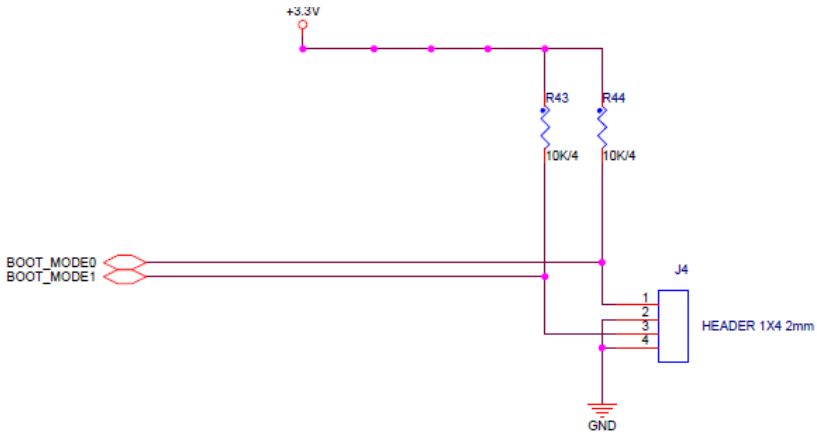
Pin 1, 2 open

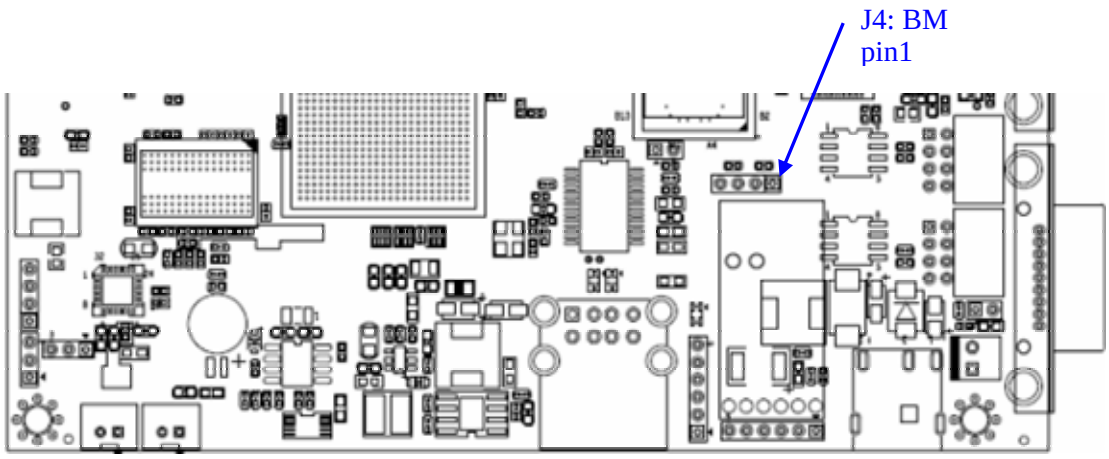
Pin 3, 4 short

Normal Operation:

Pin 1, 2 short

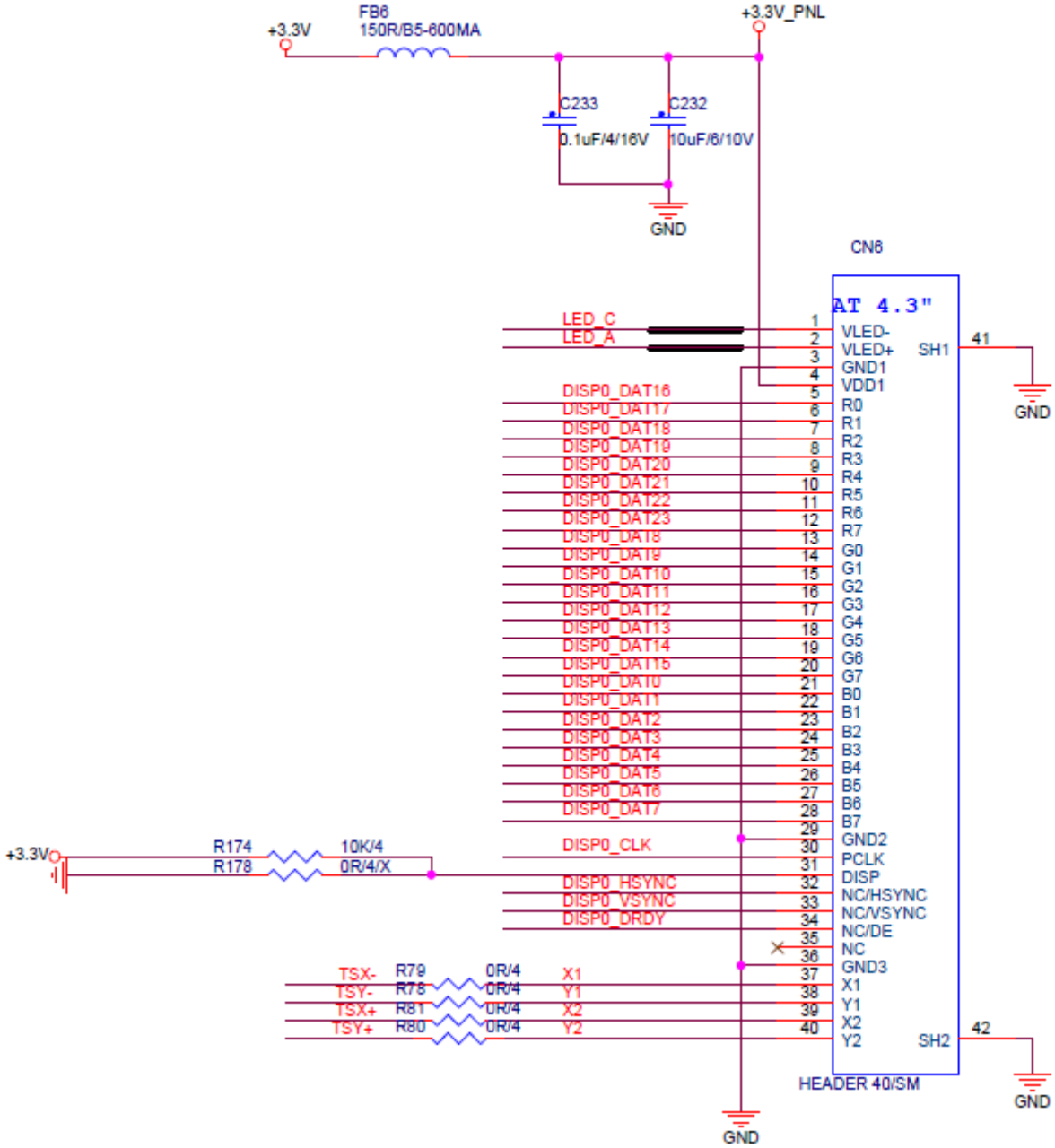
Pin 3, 4 short



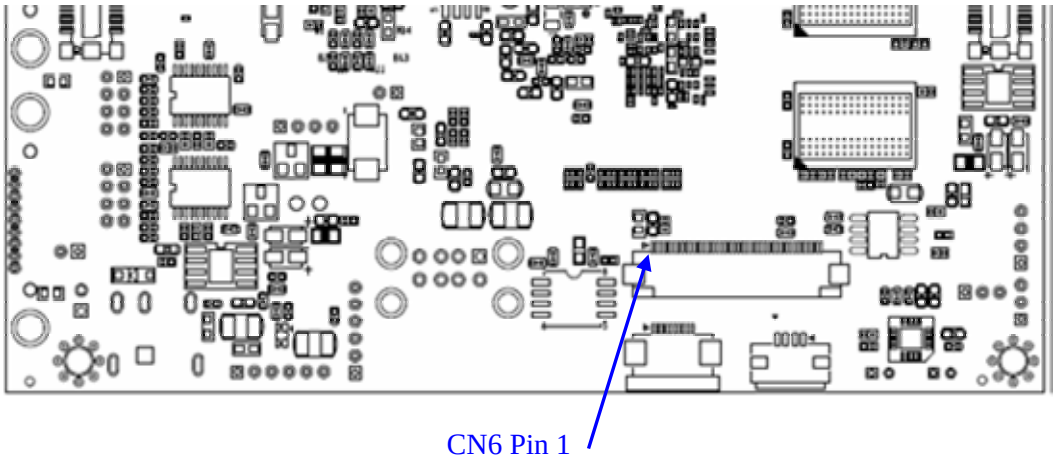


3.9 Parallel Display Interface

The parallel display interface (CN6) is a 40-pin connector designed to use with a 4.3” 480x272 LCD or 5” 800x480 LCD. Other size and resolution of LCDs can also be used with this interface with proper signal connection.

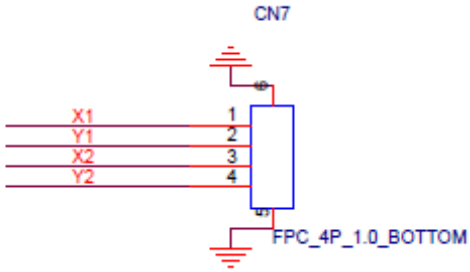


Most of the interface pins are connected directly to iMX6 processor pins. For the electrical DC/AC parameters of the pins, please refer to Freescale iMX6 processor data sheet.

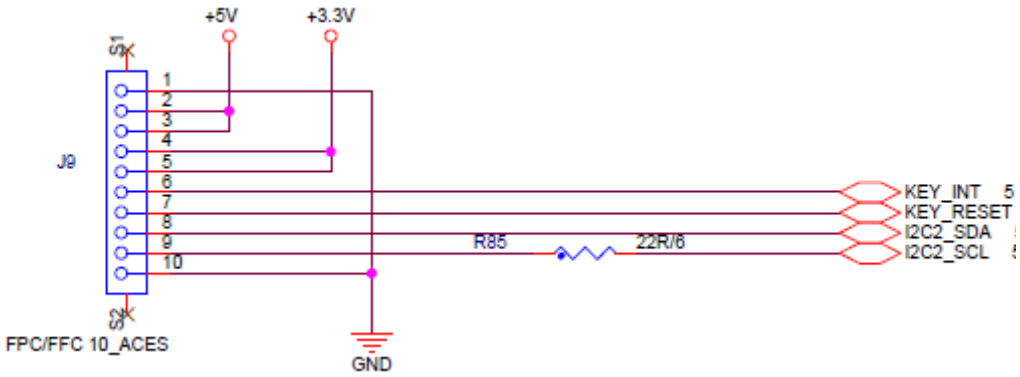


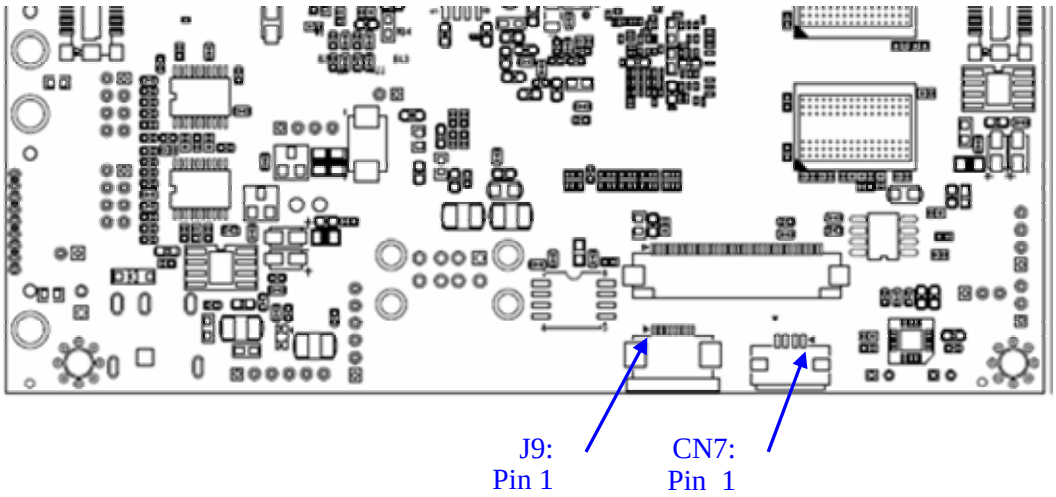
3.10 Touch Screen Interface

CN7 is for connecting to a 4-wire resistive touch screen:



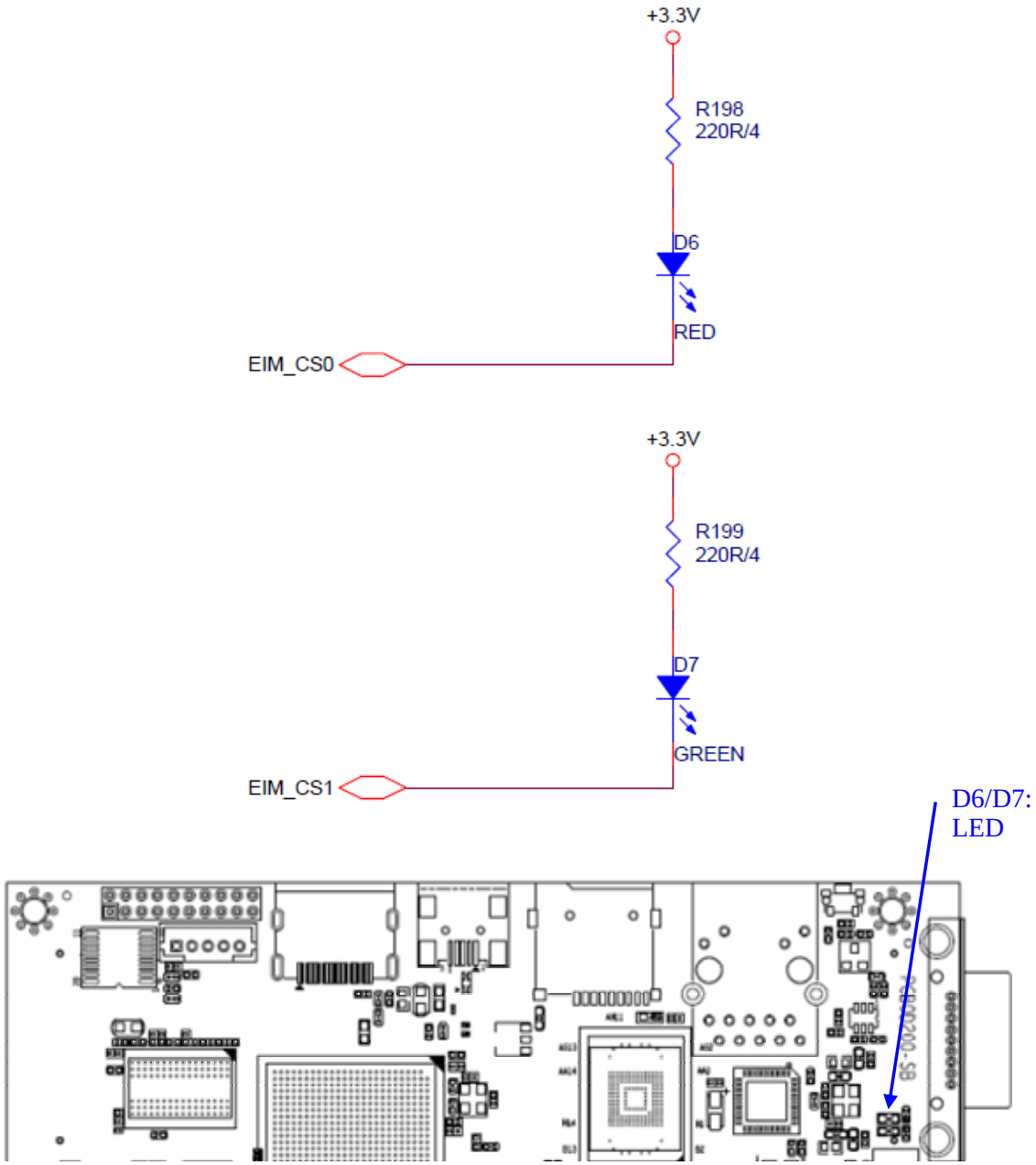
J9 can be used for capacitive touch screen or touch pad interface. In addition to +5V and +3.3V power pins, two GPIO for interrupt, reset and one I2C master port for data are on the connector.





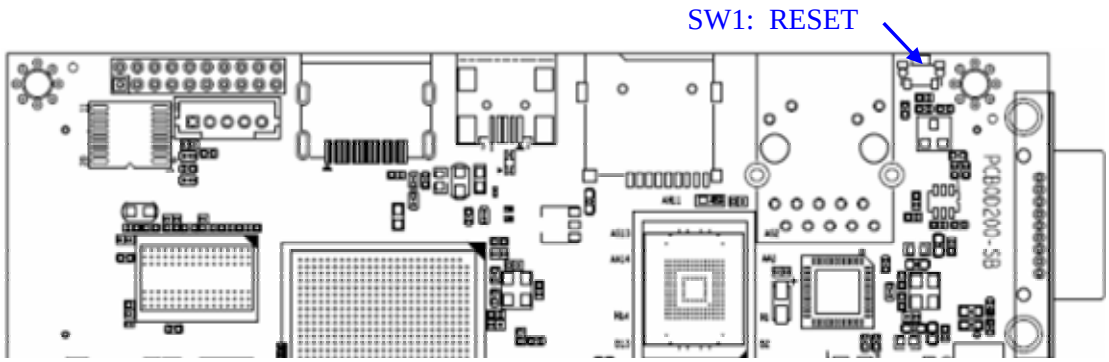
3.11 LED

D6 and D7 LEDs are connected to GPIOs for customer application software to use them. Please check with us to make sure the device driver is already available for application software to turn on/off LEDs.



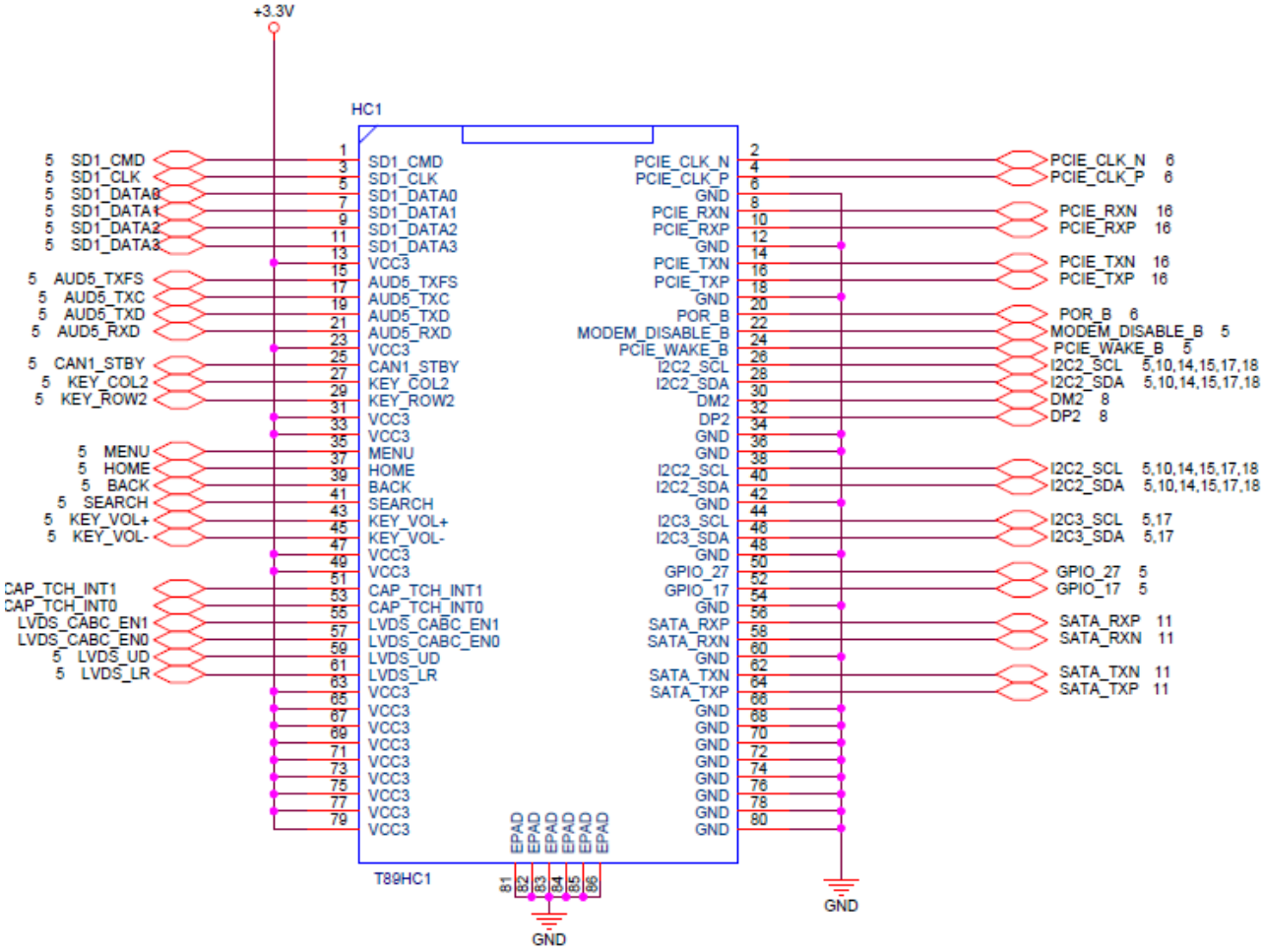
3.12 Reset Switch

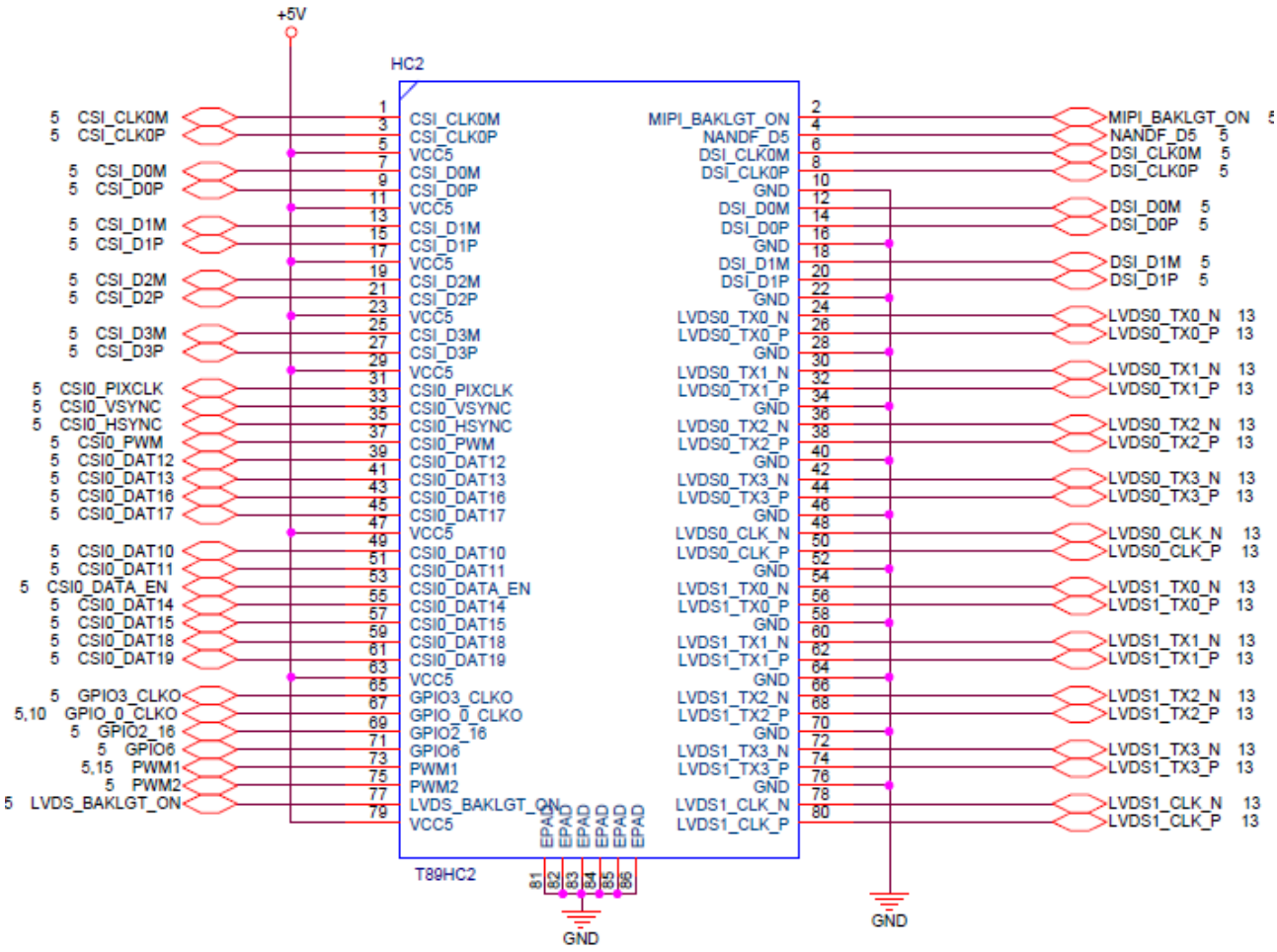
SW1 Reset switch is for system reset.



3.13 Expansion Connector

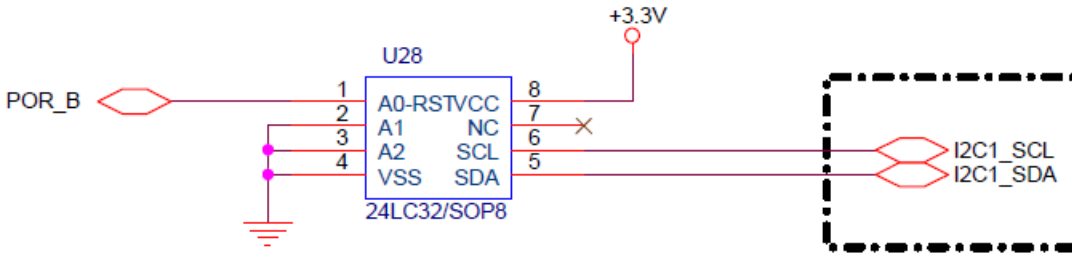
HC1 and HC2 connectors are for connecting to expansion board to realize more iMX6 functions. The interfaces on HC1 and HC2 include (but is not limited to) LVDS, MIPI, Camera interface, I2C, SD card, GPIO,etc. Contact us for more details when you plan to use the interfaces on HC1 or HC2.




+5V
HC2
T89HC2
GND
GND
5 CSI_CLK0M
5 CSI_CLK0P
5 CSI_D0M
5 CSI_D0P
5 CSI_D1M
5 CSI_D1P
5 CSI_D2M
5 CSI_D2P
5 CSI_D3M
5 CSI_D3P
5 CSI0_PIXCLK
5 CSI0_VSYNC
5 CSI0_HSYNC
5 CSI0_PWM
5 CSI0_DAT12
5 CSI0_DAT13
5 CSI0_DAT16
5 CSI0_DAT17
5 CSI0_DAT10
5 CSI0_DAT11
5 CSI0_DATA_EN
5 CSI0_DAT14
5 CSI0_DAT15
5 CSI0_DAT18
5 CSI0_DAT19
5 GPIO3_CLKO
5,10 GPIO_0_CLKO
5 GPIO2_16
5 GPIO6
5,15 PWM1
5 PWM2
5 LVDS_BAKLGT_ON
MIPI_BAKLGT_ON
NANDF_D5
DSI_CLK0M
DSI_CLK0P
DSI_D0M
DSI_D0P
DSI_D1M
DSI_D1P
LVDS0_TX0_N
LVDS0_TX0_P
LVDS0_TX1_N
LVDS0_TX1_P
LVDS0_TX2_N
LVDS0_TX2_P
LVDS0_TX3_N
LVDS0_TX3_P
LVDS0_CLK_N
LVDS0_CLK_P
LVDS1_TX0_N
LVDS1_TX0_P
LVDS1_TX1_N
LVDS1_TX1_P
LVDS1_TX2_N
LVDS1_TX2_P
LVDS1_TX3_N
LVDS1_TX3_P
LVDS1_CLK_N
LVDS1_CLK_P
MIPI_BAKLGT_ON 5
NANDF_D5 5
DSI_CLK0M 5
DSI_CLK0P 5
DSI_D0M 5
DSI_D0P 5
DSI_D1M 5
DSI_D1P 5
LVDS0_TX0_N 13
LVDS0_TX0_P 13
LVDS0_TX1_N 13
LVDS0_TX1_P 13
LVDS0_TX2_N 13
LVDS0_TX2_P 13
LVDS0_TX3_N 13
LVDS0_TX3_P 13
LVDS0_CLK_N 13
LVDS0_CLK_P 13
LVDS1_TX0_N 13
LVDS1_TX0_P 13
LVDS1_TX1_N 13
LVDS1_TX1_P 13
LVDS1_TX2_N 13
LVDS1_TX2_P 13
LVDS1_TX3_N 13
LVDS1_TX3_P 13
LVDS1_CLK_N 13
LVDS1_CLK_P 13

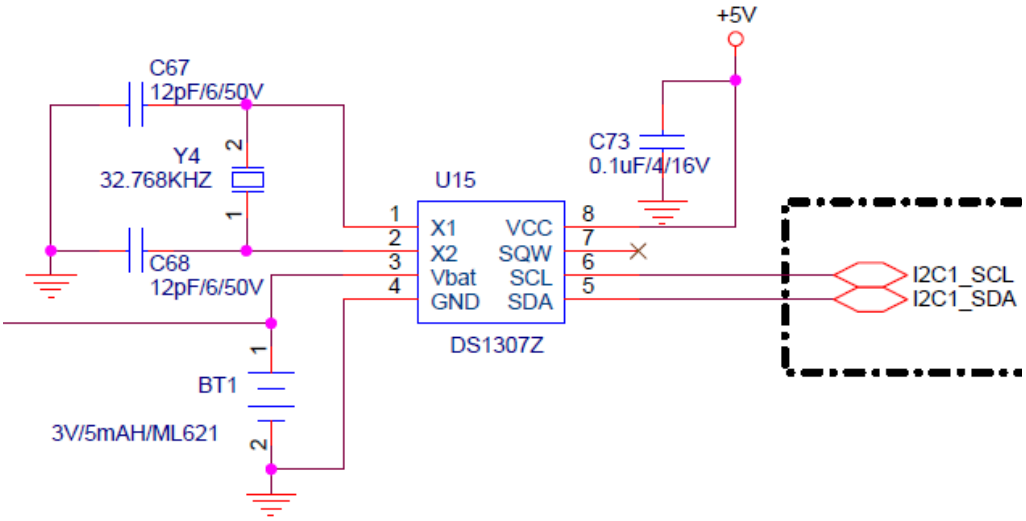
3.14 EEPROM

A 4Kx8bit (32K-bit) non-volatile eeprom is mounted on board to keep system data.
Part of the storage is available for user to store application data.
The eeprom data read/write is done by iMX6 I2C channel 1.
A device driver in Android and Linux is available for application software to read/write eeprom data.

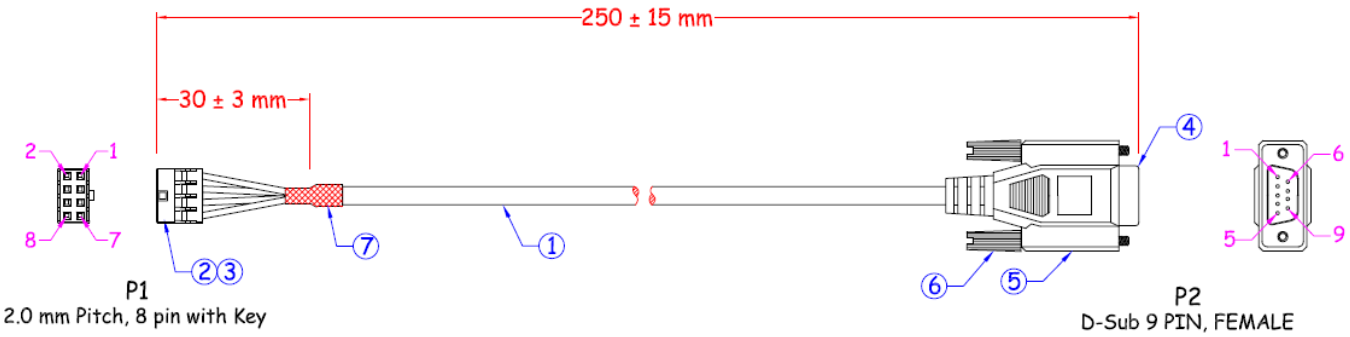


3.15 RTC (Real Time Clock)

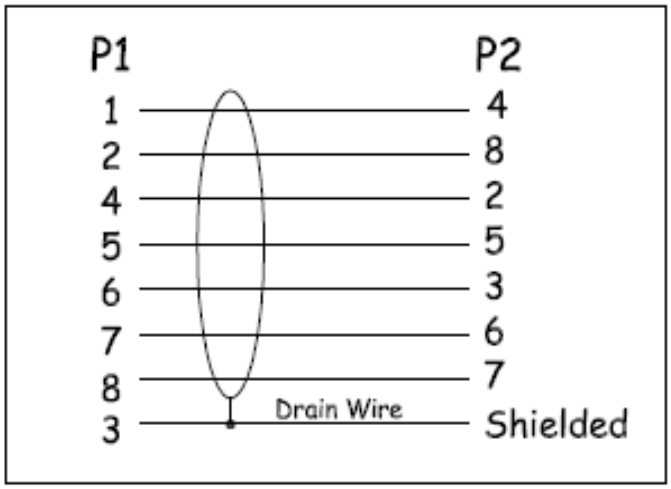
The RTC is implemented by a DS1307 real time clock chip connected to iMX6 I2C channel-1. A chargeable coin battery (3V/5mAh) is mounted on board to keep RTC in normal operation when system power is off.



Appendix A: Box Header to DB9 Cable



WIRE TERMINATIONS



Appendix B: 5-inch LCD Brief (WVGA)

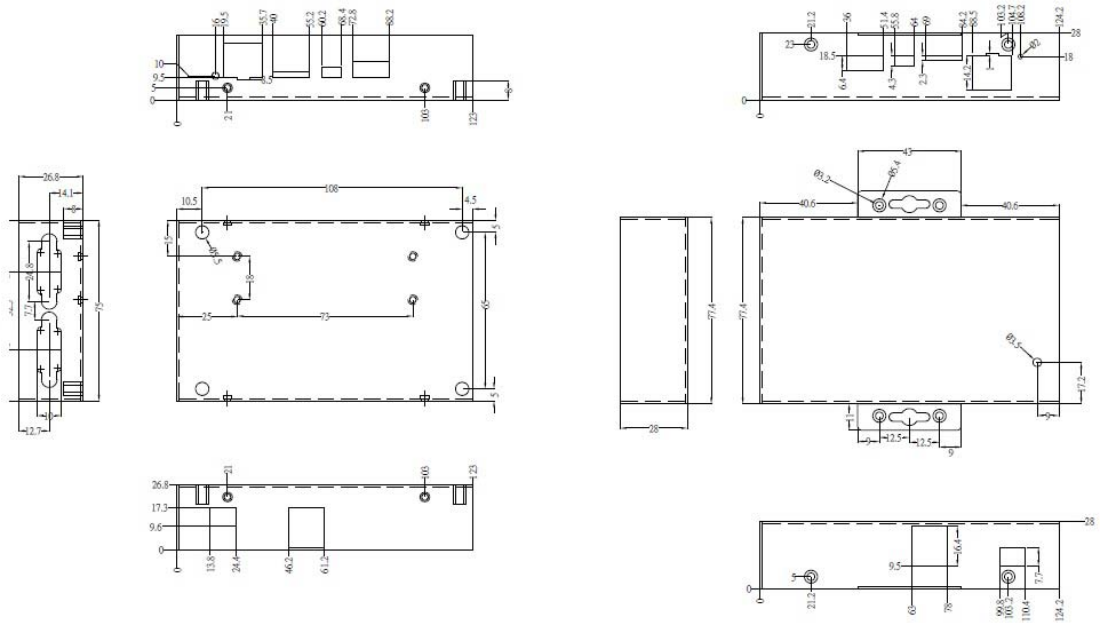
General Specifications

Item	Specification
LCD Size	5.0 inches
Driver Element	a-Si TFT active matrix
Display Resolution	800 x 3 (RGB) x 480
Display Mode	Normally white, Transmissive
Dot Pitch	0.360(W) x 0.360(H) mm
Active Area	108.00(W) x 64.80(H) mm
Module Size	120.70(W) x 75.80(H) x 4.20(D) mm (* including touch screen *)
Surface Treatment	Anti-glare(AG)
Pixel Arrangement	RGB-Stripe
Display Color	16.7M
Input Interface	Digital RGB

Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit
Power Voltage	Vdd	-0.5	5.0	V
Storage Temperature	T_{ST}	-30	80	^{o}C
Operating Temperature	T_{OP}	-20	70	^{o}C
LED Forward Current	I_F	-	25	mA

Optical Characteristics

Item	Symbol	Typical	Unit
Luminance	L	250	cd/m^2
Contrast Ratio	CR	600	--

Appendix C: Metal Frame Outline Drawing