

IBR115

**NXP Cortex™ A9 i.MX6
Dual-Lite SoC**

User's Manual

Version 1.3
(July 2026)

Copyright

© 2026 IBASE Technology, Inc. All rights reserved.

No part of this publication may be reproduced, copied, stored in a retrieval system, translated into any language or transmitted in any form or by any means, electronic, mechanical, photocopying, or otherwise, without the prior written consent of IBASE Technology, Inc. (hereinafter referred to as "IBASE").

Disclaimer

IBASE reserves the right to make changes and improvements to the products described in this document without prior notice. Every effort has been made to ensure the information in the document is correct; however, IBASE does not guarantee this document is error-free.

IBASE assumes no liability for incidental or consequential damages arising from misapplication or inability to use the product or the information contained herein, nor for any infringements of rights of third parties, which may result from its use.

Trademarks

All the trademarks, registrations and brands mentioned herein are used for identification purposes only and may be trademarks and/or registered trademarks of their respective owners.

Compliance



The product described in this manual complies with all applicable European Union (CE) directives if it has a CE marking. For systems to remain CE compliant, only CE-compliant parts may be used. Maintaining CE compliance also requires proper cable and cabling techniques.



This product has been tested and found to comply with the limits for a Class B device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with manufacturer's instructions, may cause harmful interference to radio communications.

WEEE



This product must not be disposed of as normal household waste, in accordance with the EU directive on waste electrical and electronic equipment (WEEE - 2012/19/EU). Instead, it should be disposed of by returning it to a municipal recycling collection point. Check local regulations for disposal of electronic products.

Green IBASE



This product is compliant with the current RoHS restrictions and prohibits use of the following substances in concentrations exceeding 0.1% by weight (1000 ppm) except for cadmium, limited to 0.01% by weight (100 ppm).

- Lead (Pb)
- Mercury (Hg)
- Cadmium (Cd)
- Hexavalent chromium (Cr6+)
- Polybrominated biphenyls (PBB)
- Polybrominated diphenyl ether (PBDE)

Important Safety Information

Carefully read the precautions before using the board.

Environmental conditions:

- Use this product in environments with ambient temperatures between 0°C and 60°C.
- Do not leave this product in an environment where the storage temperature may be below -40° C or above 85° C. To prevent from damages, the product must be used in a controlled environment.

Care for your iBASE products:

- Before cleaning the PCB, unplug all cables and remove the battery.
- Clean the PCB with a circuit board cleaner or degreaser, or use cotton swabs and alcohol.



WARNING

Attention during use:

- Do not use this product near water.
- Do not spill water or any other liquids on this product.
- Do not place heavy objects on the top of this product.

Anti-static precautions

- Wear an anti-static wrist strap to avoid electrostatic discharge.
- Place the PCB on an anti-static kit or mat.
- Hold the edges of PCB when handling.
- Touch the edges of non-metallic components of the product instead of the surface of the PCB.
- Ground yourself by touching a grounded conductor or a grounded bit of metal frequently to discharge any static.

 WARNING

- **INGESTION HAZARD:** This product contains a coin/button cell battery (CR2032).
- **DEATH or serious injury can occur if ingested.**
- A swallowed button cell or coin battery can cause **internal chemical burns in as little as 2 hours.**
- **KEEP new and used batteries OUT OF REACH OF CHILDREN.**
- **Seek immediate medical attention** if a battery is swallowed or suspected to be swallowed or inserted into any part of the body.



BATTERY SAFETY INSTRUCTIONS

- Remove and immediately recycle or dispose of used batteries in accordance with local regulations and keep them away from children. Do NOT dispose of batteries in household trash or incinerate.
- Even used batteries may cause severe injury or death.
- Call a local poison control center for treatment information if battery ingestion is suspected.
- Compatible Battery Models/Types: CR2032 or equivalent lithium coin cell. Nominal Voltage: 3V.
- Non-rechargeable batteries are not to be recharged.
- Do not force discharge, recharge, disassemble, or expose to temperatures outside the specified range, or incinerate. Doing so may result in injury due to venting, leakage, or explosion resulting in chemical burns.
- Ensure the battery is installed correctly according to polarity (+ and -).
- Do not mix old and new batteries, or different brands or types of batteries.
- Remove and immediately recycle or dispose of batteries from equipment not used for an extended period of time in accordance with local regulations.
- Always securely close the battery compartment. If the battery compartment does not close securely, stop using the product, remove the batteries, and keep them away from children. Battery replacement shall only be performed by qualified service personnel.

CAUTION:

- Lithium Battery Caution: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type. Dispose of batteries according to the manufacturer's instructions.
- Disposal of a battery into fire or a hot oven, or mechanically crushing or cutting of a battery, may result in an explosion.
- Leaving a battery in an extremely high temperature environment may result in an explosion or leakage of flammable liquid or gas.
- A battery subjected to extremely low air pressure may result in an explosion or leakage of flammable liquid or gas.

ATTENTION:

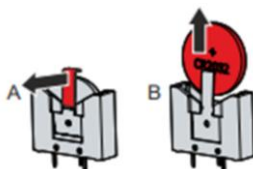
Risque d'explosion si la batterie est remplacée par un type incorrect. Mettre au rebut les batteries usagées selon les instructions.

BATTERY REPLACEMENT INSTRUCTIONS (For Qualified Service Personnel Only)

- Battery replacement shall only be performed by qualified service personnel.

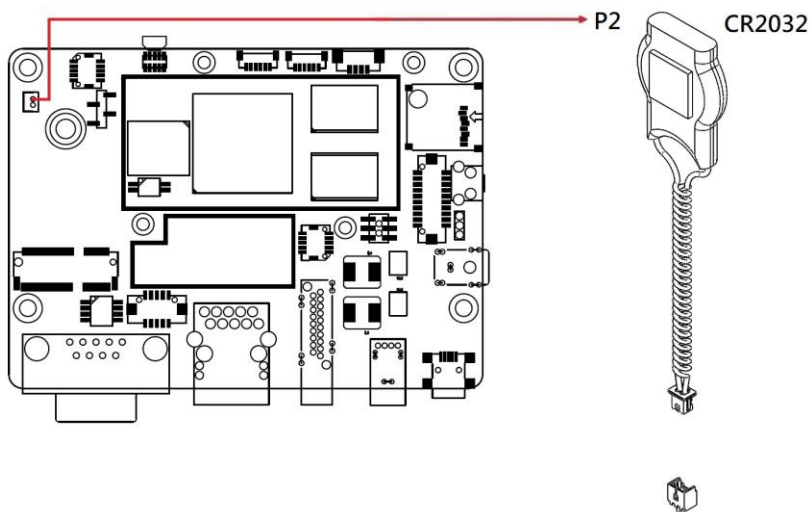
1. Bend the hook on the battery holder slightly outward (Section A).

2. Remove the battery from the holder using needle-nose pliers (Section B).



3. Insert a new CR2032 (or equivalent) lithium coin cell into the battery holder with the correct polarity (+/-).

4. Ensure the battery is securely seated in the holder before operating the system.



Warranty Policy

- **IBASE standard products:**

24-month (2-year) warranty from the date of shipment. If the date of shipment cannot be ascertained, the product serial numbers can be used to determine the approximate shipping date.

- **3rd-party parts:**

12-month (1-year) warranty from delivery for the 3rd-party parts that are not manufactured by IBASE, such as CPU, CPU cooler, memory, storage devices, power adapter, panel and touchscreen.

- * PRODUCTS, HOWEVER, THAT FAIL DUE TO MISUSE, ACCIDENT, IMPROPER INSTALLATION OR UNAUTHORIZED REPAIR SHALL BE TREATED AS OUT OF WARRANTY AND CUSTOMERS SHALL BE BILLED FOR REPAIR AND SHIPPING CHARGES.

Technical Support & Services

1. Visit the IBASE website at www.ibase.com.tw to find the latest information about the product.
2. If you need any assistance from your distributor or sales representative concerning problems that you may have encountered, please prepare the following information:
 - Product model name
 - Product serial number
 - Detailed description of the problem
 - Any error messages in text or in screenshots
 - The arrangement of the peripherals
 - Software in use (such as OS and application software, including the version numbers)
3. If repair service is required, please visit the IBASE website for the latest RMA information, or contact your distributor or IBASE sales representative for assistance.

Table of Contents

Chapter 1	General Information.....	1
1.1	Introduction	2
1.2	Features.....	2
1.3	Packing List	3
1.4	Optional Accessories	3
1.5	Specifications.....	4
1.6	Overview	6
1.7	Dimensions	7
Chapter 2	Hardware Configuration	9
2.1	M.2 Card Installation.....	10
2.2	Setting the Jumpers.....	11
2.3	Jumper & Connector Locations on IBR115	12
2.4	Jumpers Quick Reference	13
2.4.1	LVDS Power Setting (P16).....	13
2.4.2	LVDS Backlight Power Setting (P15)	14
2.5	Connectors Quick Reference.....	15
2.5.1	RS-232/422/485 Selection (SW3).....	16
2.5.2	RTC Lithium Cell Connector (P2).....	16
2.5.3	LVDS Display Connector (P8).....	17
2.5.4	LVDS Backlight Control Connector (P9)	18
2.5.5	USB Hub Connector (P13).....	18
2.5.6	COM RS-232/422/485 Port (P10)	19
2.5.7	Audio Connector (P14).....	20
2.5.8	2-Wire UART Connector (P17)	20
2.5.9	Digital (GPIO) Connector (P18)	21
2.5.10	COM RS-232 Debug Connector (P19).....	21
2.5.11	I ² C Connector (P20).....	22
2.5.12	Boot Selection (SW1).....	22

Chapter 3	Software Setup	23
3.1	Make a Recovery MicroSD Card	24
3.1.1	Preparing the Recovery MicroSD card to Install Linux/ Android image into eMMC.....	24
3.1.2	Upgrade Firmware through the Recovery SD Card	26
3.2	Display Parameter Setting in Kernel	26
Chapter 4	BSP Source Guide	27
4.1	Building BSP Source.....	28
4.1.1	Preparation	28
4.1.2	Installing Toolchain.....	28
4.1.3	Building BSP Release	28
4.1.4	Building U-Boot Single	28
4.1.5	Building Kernel Single	28
Appendix	29	
A.	How to Use GPIO in Linux	30
B.	How to Use Watchdog in Linux.....	30
C.	eMMC Test	31
D.	USB (flash disk) Test	32
E.	MicroSD Card Test	33
F.	RS-232 Test.....	34
G.	RS-485 Test.....	35
H.	Audio Test.....	35
I.	I ² C Test	36
J.	Ethernet Test	36
K.	LVDS Test.....	37
L.	HDMI Test.....	38
M.	Onboard Connector Types	39

This page is intentionally left blank.

Chapter 1

General Information

The information provided in this chapter includes:

- Features
- Packing List
- Specifications
- Block Diagram
- Board Overview
- Board Dimensions

1.1 Introduction

IBR115 is a 2.5" Disk-Size SBC with ARM Based NXP i.MX6 Cortex-A9 1GHz CPU. The device offers 2D, 3D graphics and multimedia accelerations while also supporting numerous peripherals, including RS232/422/485, COM, GPIO, USB, USB OTG, LAN and audio interfaces. For display, it supports one HDMI for a full HD display and one LVDS. For wireless connectivity, it supports M.2 Key-E, Type 2230 for the M.2 module expansion that are well suited for industrial applications.



Photo of IBR115

1.2 Features

- NXP ARM Cortex™ A9 i.MX6 Dual-Lite 1 GHz processor
- Video output through HDMI and single-channel LVDS
- 1 GB DDR3, 4 GB eMMC and MicroSD socket for expansion
- Rich I/O interface with COM, GPIO, USB, USB-OTG, audio and Ethernet
- M.2 Key-E (2230) for wireless connectivity
- 2 x UART headers
- OpenGL ES 2.0 for 3D BitBlt for 2D and OPENVG1.1 hardware accelerators

1.3 Packing List

Your IBR115 package should include the items listed below. If any item listed below is missing, contact the distributor or dealer from whom you purchased the product.

- IBR115 2.5" SBC x 1
- This User Manual x 1

1.4 Optional Accessories

IBASE provides optional accessories as follows. Please contact us or your dealer if you need any.

RF:

- WiFi & BT Combo (M.2 card)

Display:

- 7" TFT LCD – LVDS
- 15" 1024 x 768 TFT LCD – LVDS

Cable:

- Debug cable (PK1-100A)
- LVDS Cable for 7" TFT LCD – LVDS (LCD403)
- LVDS Cable for 15" 1024 x 768 TFT LCD – LVDS (LCD404)
- Backlight Cable (IVT-76)
- USB Cable (USB-134)
- GPIO Cable (PK1-124)
- UART Cable (PK1-125)
- Audio Cable (Audio-68)

1.5 Specifications

Product Name	IBR115
Form Factor	2.5" SBC
System	
Operating System	- Yocto (kernel 4.1) - Android 6.0
CPU Type	NXP Cortex™ A9 i.MX6 Dual-Lite
CPU Speed	1 GHz
Memory	System memory: 1 GB DDR3 Data Memory: 4 GB eMMC (Up to 32GB)
Video Codec	Encoder: 1080p, 30 fps (MPEG-4 SP, H.264 BP, H.263, MJPEG BP) Decoder: 1080p, 30 fps (MPEG-4 ASP, H.264 HP, MPEG-2 MP, MJPEG BP)
Touch	USB headers for CPT
Audio	1 x 10-pin box header for Line-In & Line-Out
RTC	AnalogTEK AT8565S
Wireless	WiFi / BT module (Optional)
Power Supply	12V DC-In
Watchdog Timer	Yes (256 segments, 0, 1, 2...128 secs)
Dimensions	100 x 72 mm (4" x 2.8")
RoHS	Yes
Certification	CE, FCC Class B
I/O Ports	
Display	1 x HDMI 1.4 (1080p at 60 Hz) 1 x LVDS (1366 x 768 at 60 Hz, 18-bit / 24-bit, single channel)
LAN	1 x RJ45 GbE LAN

USB	• 1 x USB 2.0 Type A • 1 x USB OTG via mini-USB Type B
Serial	• 1 x COM RS-232/422/485 port • 2 x 2-wire UART port via an onboard pin header
MicroSD	1 x MicroSD socket (max.104 MB/s)
Audio Jack	• 1 x Line-In • 1 x Line-Out
Digital IO	8 In / Out
Expansion Slots	1 x M.2 E-key (2230)
Environment	
Operating Temperature	• 0 ~ 60 °C (32 ~ 140 °F)
Extended Operating (with optional heatsink)	• -40 ~ 85 °C (-40 ~ 185 °F)
Relative Humidity	10 ~ 90 %, non-condensing

All specifications are subject to change without prior notice.

1.6 Overview

Top View



* The photos above are for reference only. Some minor components may differ.

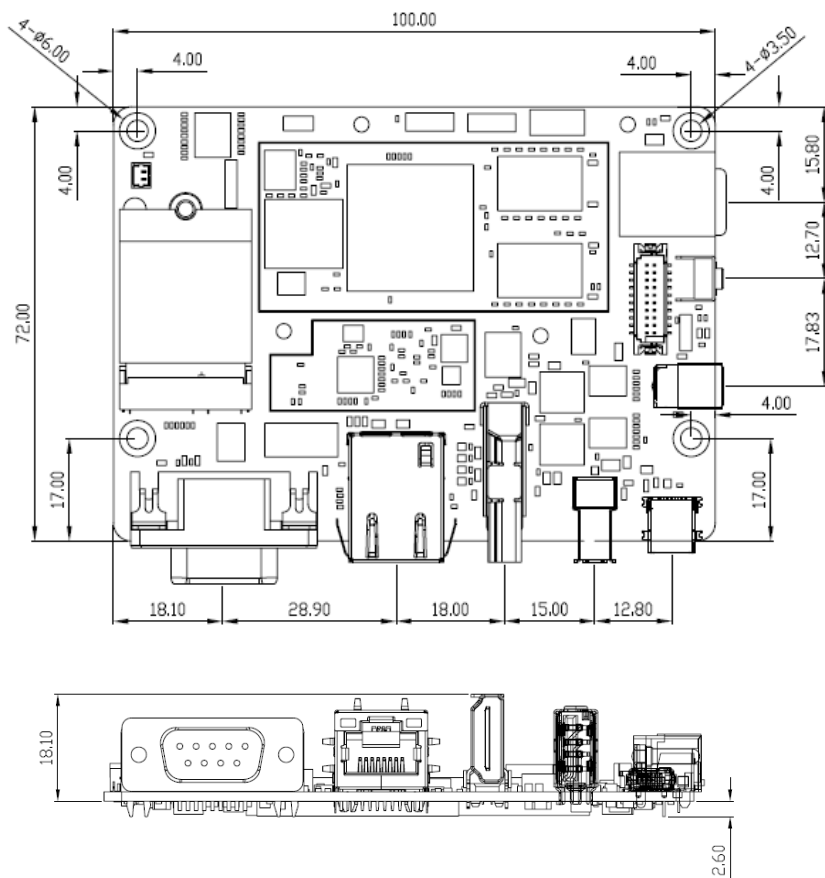
I/O View

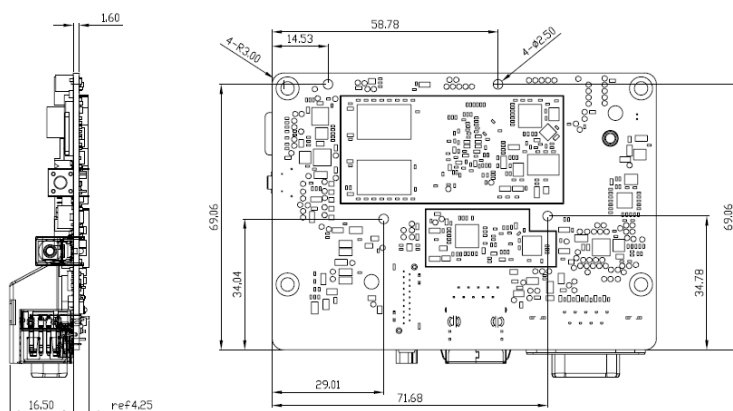


No.	Name	No.	Name
1	COM RS-232/422/485 Port	5	USB OTG Port
2	GbE LAN Port	6	DC Jack
3	HDMI Port	7	Reset Button
4	USB 2.0 Port	8	MicroSD slot

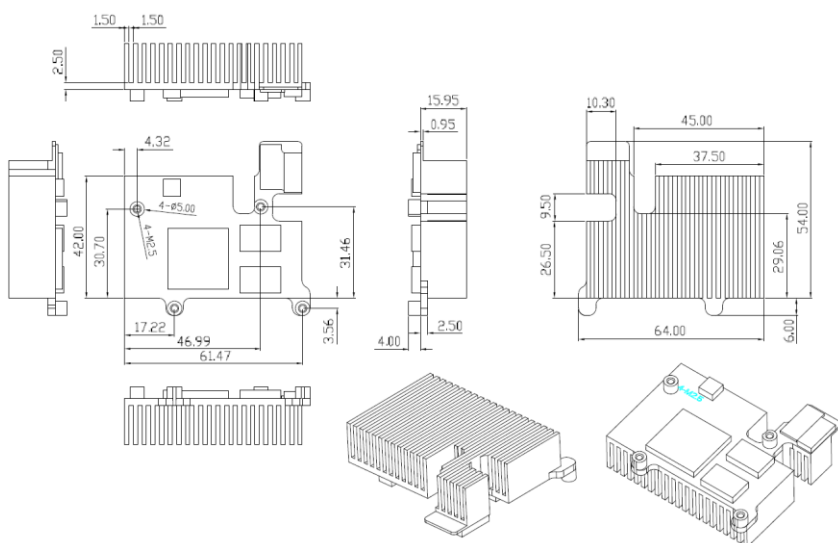
1.7 Dimensions

Unit: mm





Dimensions of the optional heatsink:



Chapter 2

Hardware Configuration

This section provides information on jumper settings and connectors on the IBR115 in order to set up a workable system. The topics covered are:

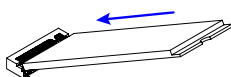
- M.2 card Installation
- Jumper and connector locations
- Jumper settings and information of connectors

2.1 M.2 Card Installation

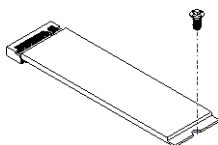
To install the NGFF M.2 card, locate the slot on the board and perform the following steps.

(For reference, the illustration below shows a typical M.2 card installation procedure.)

1. Align the key of the M.2 card to the interface, and insert the card slantwise.



2. Push the M.2 card down, fix it onto the brass standoff with a screw.

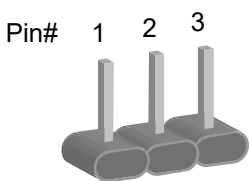


2.2 Setting the Jumpers

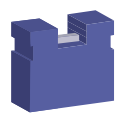
Set up and configure your IBR115 by using jumpers for various settings and features according to your needs and applications. Contact your supplier if you have doubts about the best configuration for your use.

2.2.1 How to Set Jumpers

Jumpers are short-length conductors consisting of several metal pins with a non-conductive base mounted on the circuit board. Jumper caps are used to have the functions and features enabled or disabled. If a jumper has 3 pins, you can connect either PIN1 to PIN2 or PIN2 to PIN3 by shorting.

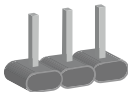
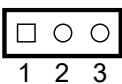
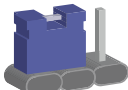
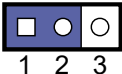
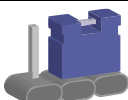
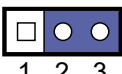


A 3-pin jumper



A jumper cap

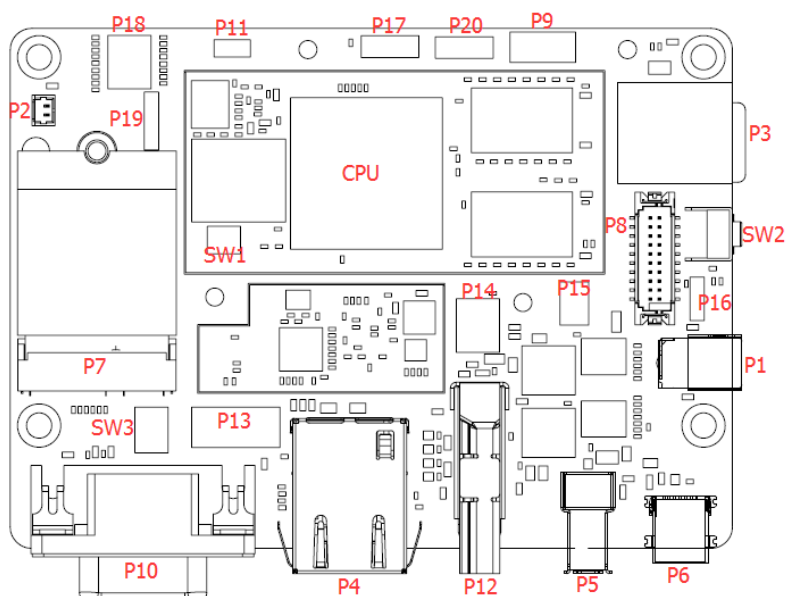
Refer to the illustration below to set jumpers.

Pin closed	Oblique view	Illustration
Open		
1-2		
2-3		

When two pins of a jumper are encased in a jumper cap, this jumper is **closed**, i.e. turned **On**.

When a jumper cap is removed from two jumper pins, this jumper is **open**, i.e. turned **Off**.

2.3 Jumper & Connector Locations on IBR115

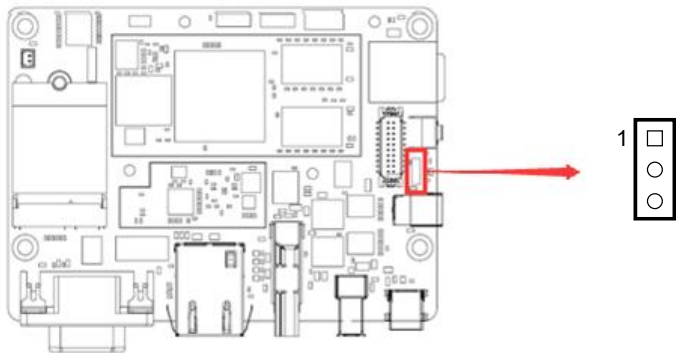


Board diagram of IBR115

2.4 Jumpers Quick Reference

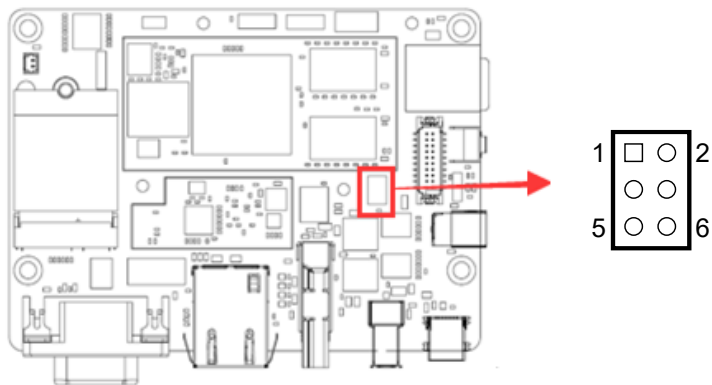
Function	Jumper Name	Page
LVDS Power Setting	P16	13
LVDS Backlight Power Setting	P15	14

2.4.1 LVDS Power Setting (P16)



Function	Pin closed	Illustration
3.3V (default)	1-2	1
5V	2-3	1

2.4.2 LVDS Backlight Power Setting (P15)

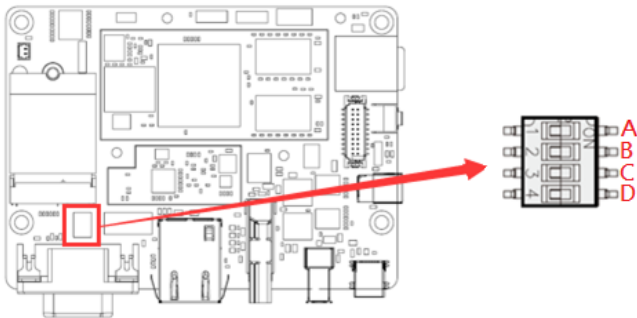


Function	Pin closed	Illustration
3.3V (default)	1-2	
5V	3-4	
12V	5-6	

2.5 Connectors Quick Reference

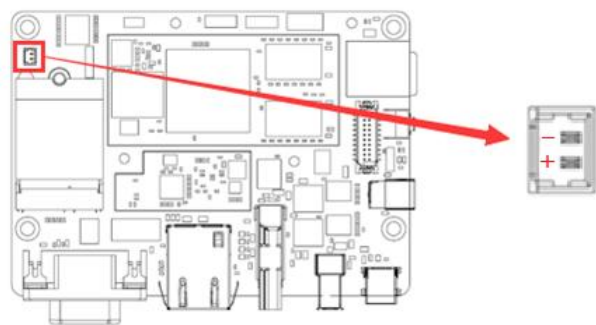
Function	Connector Name	Page
RS-232/422/485 Selection	SW3	16
RTC Lithium Cell Connector	P2	16
LVDS Display Connector	P8	17
LVDS Backlight Control Connector	P9	18
USB Hub Connector	P13	18
COM RS-232/422/485 Port	P10	19
Audio Connector	P14	20
2-Wire UART Connector	P17	20
Digital (GPIO) Connector	P18	21
COM RS-232 Debug Connector	P19	21
I ² C Connector	P20	22
Boot Mode Selection	SW1	22
System Reset Button	SW2	--
DC Jack	P1	--
MicroSD Card Connector	P3	--
GbE LAN Port	P4	--
USB 2.0 Type A Port	P5	--
Mini-USB OTG Port	P6	--
NGFF M.2 Slot	P7	--
HDMI Port	P12	--
Factory Use Only	P11	--

2.5.1 RS-232/422/485 Selection (SW3)



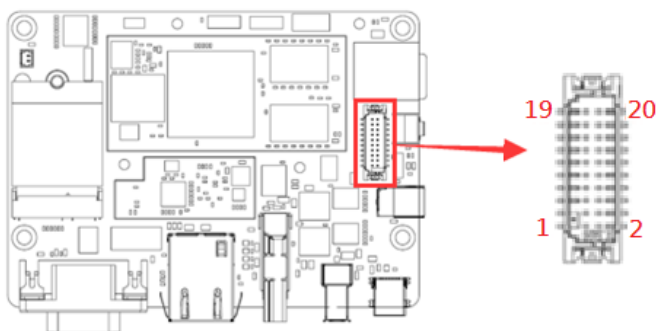
Panel Type	A	B	C	D
RS-422 Full Duplex	NC	ON	ON	ON
Pure RS232 (3T/5R)	NC	OFF	ON	ON
RS-485 Half Duplex (TX Low-Active)	NC	ON	OFF	ON
RS-485 Half Duplex (TX High-Active)	NC	OFF	OFF	ON
RS-422 Full Duplex	NC	ON	ON	OFF
RS-485 Half Duplex	NC	ON	OFF	OFF
Shutdown (Default)	NC	OFF	OFF	OFF

2.5.2 RTC Lithium Cell Connector (P2)



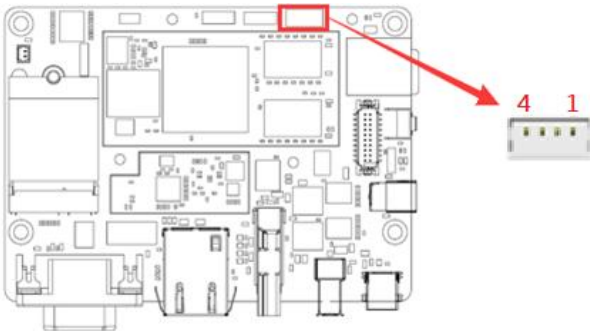
Pin	Signal Name	Pin	Signal Name
1	RTC_VCC	2	Ground

2.5.3 LVDS Display Connector (P8)



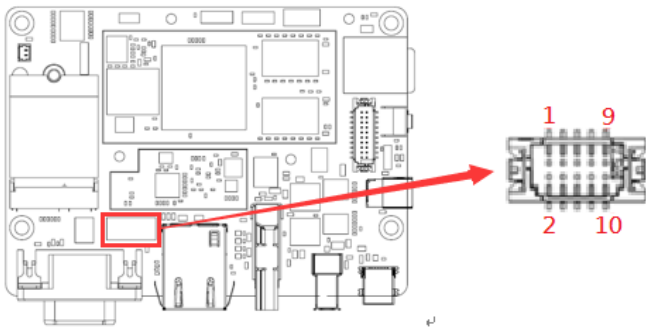
Pin	Signal Name	Pin	Signal Name
1	LCD1_TX0_P	2	LCD1_TX0_N
3	Ground	4	Ground
5	LCD1_TX1_P	6	LCD1_TX1_N
7	Ground	8	LCD_VDD
9	LCD1_TX3_P	10	LCD1_TX3_N
11	LCD1_TX2_P	12	LCD1_TX2_N
13	Ground	14	Ground
15	LCD1_CLK_P	16	LCD1_CLK_N
17	BTL_PWM	18	LCD_VDD
19	BKLT_VCC	20	BKLT_VCC

2.5.4 LVDS Backlight Control Connector (P9)



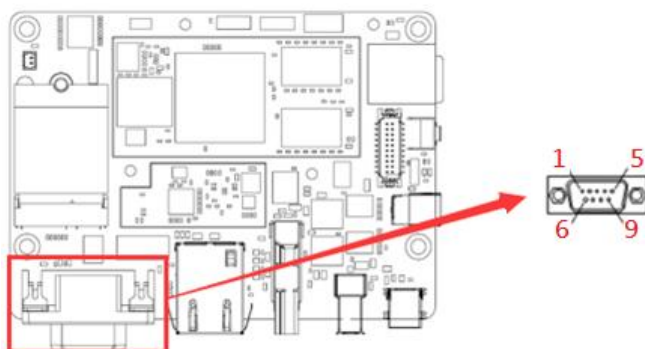
Pin	Signal Name	Pin	Signal Name
1	BKLT_VCC	3	LCD_BKLT_PWM
2	LCD_BKLT_EN	4	Ground

2.5.5 USB Hub Connector (P13)



Pin	Signal Name	Pin	Signal Name
1	Ground	2	NC
3	USB1_DP	4	USB2_POWER
5	USB1_DM	6	USB2_DM
7	USB1_POWER	8	USB2_DP
9	NC	10	Ground

2.5.6 COM RS-232/422/485 Port (P10)

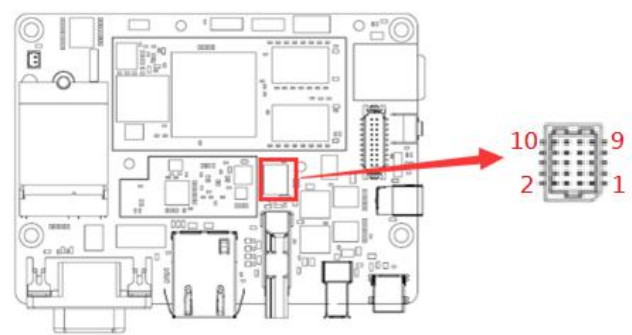


Refer to SW3 setting for RS-232/422/485 mode selection.

Pin	Signal Name	Pin	Signal Name
1	DCD, Data carrier detect	6	DSR, Data set ready
2	RXD, Receive data	7	RTS, Request to send
3	TXD, Transmit data	8	CTS, Clear to send
4	DTR, Data terminal ready	9	NC
5	Ground		

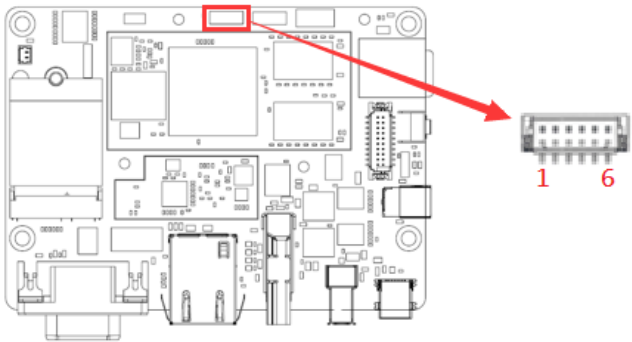
Pin	Assignment		
	RS-232	RS-422	RS-485
1	DCD	TX-	DATA-
2	RX	TX+	DATA+
3	TX	RX+	NC
4	DTR	RX-	NC
5	Ground	Ground	Ground
6	DSR	NC	NC
7	RTS	NC	NC
8	CTS	NC	NC
9	NC	NC	NC

2.5.7 Audio Connector (P14)



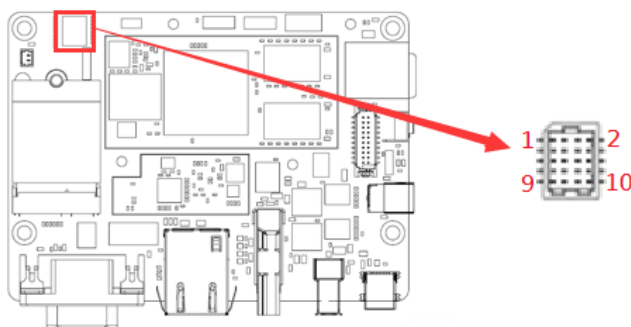
Pin	Signal Name	Pin	Signal Name
1	NC	2	Ground
3	LINE_IN_R	4	Ground
5	LINE_IN_L	6	Ground
7	Ground	8	LINE_OUT_L
9	Ground	10	LINE_OUT_R

2.5.8 2-Wire UART Connector (P17)



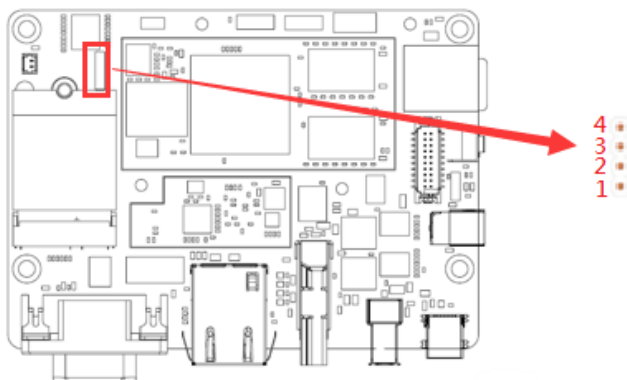
Pin	Signal Name	Pin	Signal Name
1	UART2_TXD	4	UART3_TXD
2	UART2_RXD	5	UART3_RXD
3	Ground	6	Ground

2.5.9 Digital (GPIO) Connector (P18)



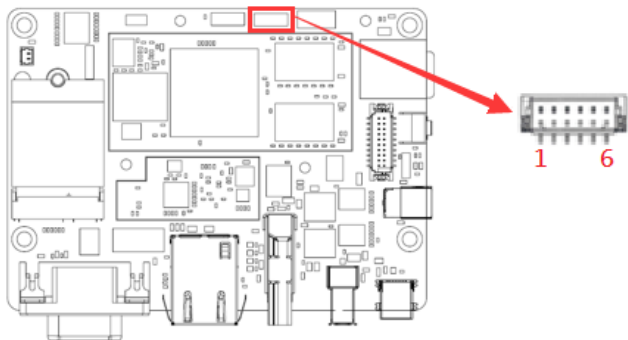
Pin	Signal Name	Pin	Signal Name
1	3.3V	2	DIO5
3	DIO1	4	DIO6
5	DIO2	6	DIO7
7	DIO3	8	DIO8
9	DIO4	10	Ground

2.5.10 COM RS-232 Debug Connector (P19)



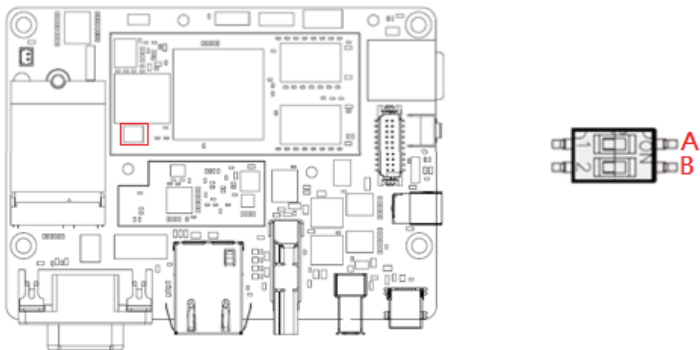
Pin	Signal Name	Pin	Signal Name
1	RX, Receive data	3	Ground
2	TX, Transmit data	4	5V

2.5.11 I²C Connector (P20)



Pin	Signal Name	Pin	Signal Name
1	VCC	4	I2C_SCL
2	TP_INT_B	5	I2C_SDA
3	TP_RST_B	6	GND

2.5.12 Boot Selection (SW1)



Boot Mode	SW1A	Boot Media	SW1B
Normal Boot (Default)	OFF	SDHC3(eMMC) (Default)	OFF
Download	ON	SDHC2(SD)	ON

Chapter 3

Software Setup

This chapter introduces installation of the following:

- Make a recovery microSD card (for advanced users only)
- Display parameter setting in kernel

3.1 Make a Recovery MicroSD Card

Note: This is for advanced users who have IBASE standard image file only.

Basically, IBR115 is preloaded with O.S (Android / Linux) into eMMC by default. Connect the TFT-LCD with IBR115 (or HDMI), and 12V power directly.

This chapter guides you to make a recovery boot-up microSD card. IBASE optionally provides 7" /15" LVDS panel and HDMI display for you to prepare the software application pre-development easily under Windows platform.

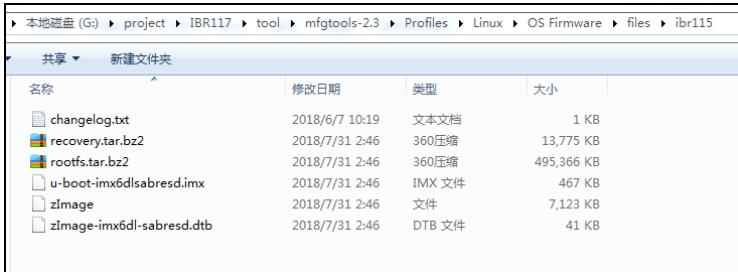
3.1.1 Preparing the Recovery MicroSD card to Install Linux/ Android image into eMMC

Note: All data in the eMMC will be erased.

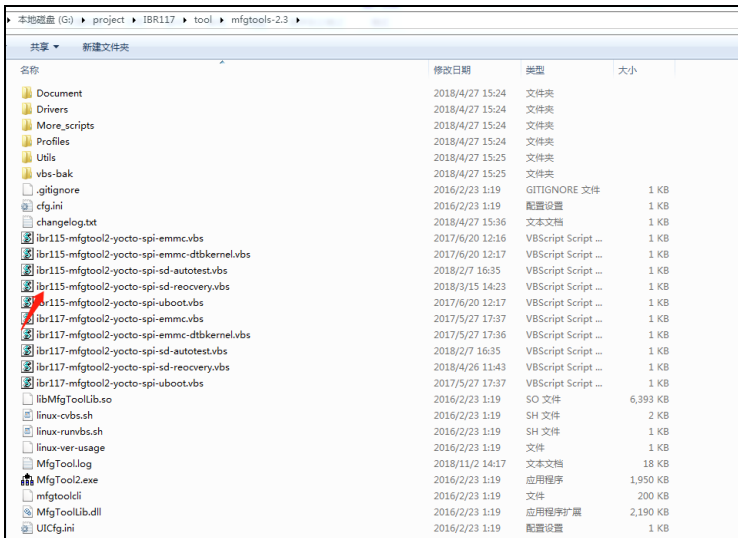
1. System requirements:
Operating System: Windows 7 or later
Tool: mfgtools-2.3
SD card: 4GB or greater in size
2. Insert your SD card to this board (i.e. the P3 connector), connect the board to PC through the mini-USB port (i.e. the P6 connector), and set SW1 to Download mode.



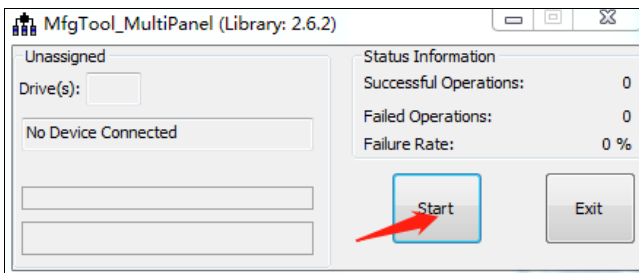
3. Copy the image to the directory **mfgtools-2.3\Profiles\Linux\OS Firmware\files\libr115**.



4. Select the script of **mfgtools sdcard recovery**.

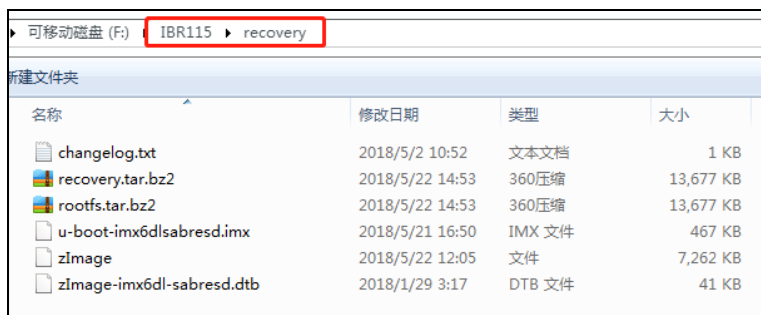


5. Start burning image to SD card. When the image burning finishes, the recovery SD card is ready.



3.1.2 Upgrade Firmware through the Recovery SD Card

1. Copy the image files which you'd like to upgrade to U-disk **/IBR115/recovery/**.



2. Insert the recovery SD card and U-disk to the board for upgrade.
3. Power up the board and the recovery program starts.
4. When the recovery finishes, power down the board, pull out the recovery SD card and U-disk.

3.2 Display Parameter Setting in Kernel

IBR115 supports LVDS 15" output by default.

1. If you use HDMI to display, run the command:

```
/home/root/display_config/config_display_mode.sh 1
```

2. If you use LVDS 7" to display, run the command:

```
/home/root/display_config/config_display_mode.sh 2
```

3. If you use LVDS 15" to display, run the command:

```
/home/root/display_config/config_display_mode.sh 3
```



Chapter 4

BSP Source Guide

This chapter is dedicated for advanced software engineers only to build BSP source. The topics covered in this chapter are as follows:

- Preparation
- Installing Toolchain
- Building BSP Release
- Building U-Boot
- Building Kernel

4.1 Building BSP Source

4.1.1 Preparation

The suggested Host platform is Ubuntu 12.04 and 14.04 in x86 and x64 versions.

1. Install necessary packages before building:

```
sudo apt-get install gawk wget Git-core diffstat unzip texinfo
sudo apt-get install gcc-multilib build-essential chrpath socat
sudo add-apt-repository ppa:git-core/ppa
sudo apt-get update
sudo apt-get install git
sudo apt-get install texinfo
```

2. Decompress the IBR115 source file `ibr115-bsp.tar.bz2` into `"/home/"` folder.

4.1.2 Installing Toolchain

Decompress Toolchain **poky.tar** into directory `"/opt"`.

4.1.3 Building BSP Release

```
cd /home/ibr115-bsp
./build-bsp.sh
```

4.1.4 Building U-Boot Single

```
cd /home/ibr115-bsp/uboot/
./build.sh
```

4.1.5 Building Kernel Single

```
cd /home/ibr115-bsp/kernel/
./build.sh
```

Appendix

This section provides the information of reference code.

A. How to Use GPIO in Linux

```
# Take gpio1_0 as example, export value:1*32+0=32
```

```
# GPIO example 1: Output
```

```
echo 32 > /sys/class/gpio/export
```

```
echo out > /sys/class/gpio/gpio32/direction
```

```
echo 0 > /sys/class/gpio/gpio32/value
```

```
echo 1 > /sys/class/gpio/gpio32/value
```

```
# GPIO example 2: Input
```

```
echo 32 > /sys/class/gpio/export
```

```
echo in > /sys/class/gpio/gpio32/direction
```

```
cat /sys/class/gpio/gpio32/value
```

B. How to Use Watchdog in Linux

```
// create fd
int fd;
//open watchdog device
fd = open("/dev/watchdog", O_WRONLY);
//get watchdog support
ioctl(fd, WDIOC_GETSUPPORT, &ident);
//get watchdog status
ioctl(fd, WDIOC_GETSTATUS, &status);
//get watchdog timeout
ioctl(fd, WDIOC_GETTIMEOUT, &timeout_val);
//set watchdog timeout
ioctl(fd, WDIOC_SETTIMEOUT, &timeout_val);
//feed dog
ioctl(fd, WDIOC_KEEPALIVE, &dummy);
```

C. eMMC Test

Note: This operation may damage the data stored in eMMC flash. Before starting the test, make sure there is no critical data in the eMMC flash being used.

- **Read, write, and check**

```
MOUNT_POINT_STR="/var"

#create data file
dd if=/dev/urandom of=/tmp/data1 bs=1024k count=10
#write data to emmc
dd if=/tmp/data1 of=$MOUNT_POINT_STR/data2 bs=1024k count=10
#read data2, and compare with data1
cmp $MOUNT_POINT_STR/data2 /tmp/data1
```

- **eMMC speed test**

```
MOUNT_POINT_STR="/var"

#get emmc write speed"
time dd if=/dev/urandom of=$MOUNT_POINT_STR/test bs=1024k count=10
# clean caches
echo 3 > /proc/sys/vm/drop_caches
#get emmc read speed"
time dd if=$MOUNT_POINT_STR/test of=/dev/null bs=1024k count=10
```

D. USB (flash disk) Test

Insert the USB flash disk then assure it is in IBR115 device list.

Note: This operation may damage the data stored in the USB flash disk. Before starting the test, make sure there is no critical data in the eMMC flash being used.

- **Read, write, and check**

```
USB_DIR="/run/media/mmcblk1p1"
#create data file
dd if=/dev/urandom of=/var/data1 bs=1024k count=100
#write data to usb flash disk
dd if=/var/data1 of=$USB_DIR/data2 bs=1024k count=100
#read data2, and compare with data1
cmp $USB_DIR/data2 /var/data1
```

- **USB speed test**

```
USB_DIR="/run/media/mmcblk1p1"
# usb write speed
dd if=/dev/zero of=$BASIC_DIR/$i/test bs=1M count=1000 oflag=nocache

# usb read speed
dd if=$BASIC_DIR/$i/test of=/dev/null bs=1M oflag=nocache
```

E. MicroSD Card Test

When IBR115 is booted from eMMC, microSD card is “/dev/mmcblk1” and able to see by “ls /dev/mmcblk1*” command:

```
/dev/mmcblk1 /dev/mmcblk1p2 /dev/mmcblk1p4 /dev/mmcblk1p5
/dev/mmcblk1p6
```

When booting from microSD card, replace test pattern “/dev/mmcblk1” to “/dev/mmcblk0”.

Note: This operation may damage the data stored the microSD card. Before starting the test, make sure there is no critical data in the eMMC flash being used.

- **Read, write, and check**

```
SD_DIR="/run/media/mmcblk1"
#create data file
dd if=/dev/urandom of=/var/data1 bs=1024k count=100
#write data to SD card
dd if=/var/data1 of=$SD_DIR/data2 bs=1024k count=100
#read data2, and compare with data1
cmp $SD_DIR/data2 /var/data1
```

- **MicroSD card speed test**

```
SD_DIR="/run/media/mmcblk1"

# SD write speed
dd if=/dev/zero of=$SD_DIR/test bs=1M count=1000 oflag=nocache

# SD read speed
dd if=$SD_DIR/test of=/dev/null bs=1M oflag=nocache
```

F. RS-232 Test

```
//open ttymxc1
fd = open(/dev/ttymxc1,O_RDWR );

//set speed
tcgetattr(fd, &opt);
cfsetispeed(&opt, speed);
cfsetospeed(&opt, speed);
tcsetattr(fd, TCSANOW, &opt)

//get_speed
tcgetattr(fd, &opt);
speed = cfgetispeed(&opt);

//set_parity
// options.c_cflag
options.c_cflag &= ~CSIZE;
options.c_cflag &= ~CSIZE;
options.c_iflag &= ~(ICANON | ECHO | ECHOE | ISIG); /*Input*/
options.c_oflag &= ~OPOST; /*Output*/
//options.c_cc
options.c_cc[VTIME] = 150;
options.c_cc[VMIN] = 0;
#set parity
tcsetattr(fd, TCSANOW, &options)

//write ttymxc1
write(fd, write_buf, sizeof(write_buf));

//read ttymxc1
read(fd, read_buf, sizeof(read_buf)))
```

G. RS-485 Test

```
//open ttymxc1
fd = open(/dev/ttymxc1,O_RDWR );

//set speed
tcgetattr(fd, &opt);
cfsetispeed(&opt, speed);
cfsetospeed(&opt, speed);
tcsetattr(fd, TCSANOW, &opt

//get_speed
tcgetattr(fd, &opt);
speed = cfgetispeed(&opt);

//set_parity
// options.c_cflag
options.c_cflag &= ~CSIZE;
options.c_cflag &= ~CSIZE;
options.c_iflag &= ~(ICANON | ECHO | ECHOE | ISIG); /*Input*/
options.c_oflag &= ~OPOST; /*Output*/
//options.c_cc
options.c_cc[VTIME] = 150;
options.c_cc[VMIN] = 0;
#set parity
tcsetattr(fd, TCSANOW, &options)

//write ttymxc1
write(fd, write_buf, sizeof(write_buf));

//read ttymxc1
read(fd, read_buf, sizeof(read_buf)))
```

H. Audio Test

```
// play mp3 by audio (ALC5640)
gplay-1.0 /home/root/ testscript/audio/a.mp3 -D plughw:1,0
// record mp3 by audio (ALC5640)
arecord -f cd $basepath/b.mp3 -D plughw:1,0
```

I. I²C Test

```
// Connect RTC-IC (at88sc25616c) to I2C bus
// run "i2cdetect -y 2" to read chip address
Sudo i2cdetect -y 2
    0 1 2 3 4 5 6 7 8 9 a b c d e f
00:  --  -----
10:  --  -----
20:  --  -----
30:  --  -----
40:  --  -----
50:  --  ----- 58 59 5a 5b 5c 5d 5e 5f
60:  --  -----
70:  --  -----
```

J. Ethernet Test

- **Ethernet FTP test**

```
#install ftp
sudo chmod 777 /home/root/testscript/ethernet/lftp_library/lftp
sudo cp /home/root/testscript/ethernet/lftp_library/lftp /usr/bin/
sudo mkdir /usr/lib/lftp
sudo mkdir /usr/lib/lftp/4.6.3a
sudo cp /home/root/testscript/ethernet/lftp_library/*.so /usr/lib/lftp/4.6.3a
sudo cp /home/root/testscript/ethernet/lftp_library/* /lib/

#lftp server 192.168.1.123
lftp 192.168.1.123 <<EOF
#upload data to server 192.168.1.123
put data1
#download data from server 192.168.1.123
get data1
#exit lftp
bye
```

- **Ethernet Ping test**

```
#ping server 192.168.1.123
ping -c 20 192.168.1.123 >/tmp/ethernet_ping.txt
```

- **Ethernet TCP test**

```
#server 192.168.1.123 run command "iperf3 -s"
#communicate with server 192.168.1.123 in tcp mode by iperf3
iperf3 -c 192.168.1.123 -i 1 -t 20 -w 32M -P 4
```

- **Ethernet UDP test**

```
#server 192.168.1.123 run command "iperf3 -s"
#communicate with server 192.168.1.123 in udp mode by iperf3
iperf3 -c $SERVER_IP -u -i 1 -b 200M
```

K. LVDS Test

```
//Open the file for reading and writing
framebuffer_fd = open("/dev/fb0", O_RDWR);

// Get fixed screen information
ioctl(framebuffer_fd, FBIOGET_FSCREENINFO, &finfo)

// Get variable screen information
ioctl(framebuffer_fd, FBIOGET_VSCREENINFO, &vinfo)

// Figure out the size of the screen in bytes
screensize = vinfo.xres * vinfo.yres * vinfo.bits_per_pixel / 8;

// Map the device to memory
fbp = (char *)mmap(0, screensize, PROT_READ | PROT_WRITE, MAP_SHARED, framebuffer_fd, 0);

// Figure out where in memory to put the pixel
memset(fbp, 0x00, screensize);

//draw point by fbp
long int location = 0;
location = (x+g_xoffset) * (g_bits_per_pixel/8) +
(y+g_yoffset) * g_line_length;
*(fbp + location + 0) = color_b;
*(fbp + location + 1) = color_g;
*(fbp + location + 2) = color_r;

//close framebuffer fd
close(framebuffer_fd);
```

L. HDMI Test

- **HDMI display test**

```
//Open the file for reading and writing
framebuffer_fd = open("/dev/fb2", O_RDWR);

// Get fixed screen information
ioctl(framebuffer_fd, FBIOGET_FSCREENINFO, &finfo)

// Get variable screen information
ioctl(framebuffer_fd, FBIOGET_VSCREENINFO, &vinfo)

// Figure out the size of the screen in bytes
screensize = vinfo.xres * vinfo.yres * vinfo.bits_per_pixel / 8;

// Map the device to memory
fbp = (char *)mmap(0, screensize, PROT_READ | PROT_WRITE, MAP_SHARED, framebuffer_fd, 0);

// Figure out where in memory to put the pixel
memset(fbp, 0x00, screensize);

//draw point by fbp
long int location = 0;
location = (x+g_xoffset) * (g_bits_per_pixel/8) +
(y+g_yoffset) * g_line_length;
*(fbp + location + 0) = color_b;
*(fbp + location + 1) = color_g;
*(fbp + location + 2) = color_r;

//close framebuffer fd
close(framebuffer_fd);
```

- **HDMI audio test**

```
#enable hdmi audio
echo 0 > /sys/class/graphics/fb2/blank
#play wav file by hdmi audio
aplay /home/root/testscript/hdmi/1K.wav -D plughw:0,0
```

M. Onboard Connector Types

Function	Connector Name	Onboard Type	Compatible Mating Type for Reference
LVDS Display Connector	P8	Hirose DF13E-20DP-1.25V	Hirose DF13-20DS-1.25C
LVDS Backlight Control Connector	P9	TechBest 1024041008	Molex 51021-0400
USB Hub Connector	P13	Hirose DF13E-10DP-1.25V	Hirose DF13E-10DP-1.25C
Audio Connector	P14	E-Call 0110-01-53101100	JCTC 11002H00-1P Well-Lin, 1010H
2-Wire UART Connector	P17	TechBest WT02M-30002-06132	JST SHR-03V-S-B
Digital (GPIO) Connector	P18	E-Call 0110-01-53101100	JCTC 11002H00-1P Well-Lin, 1010H