

FS051

Embedded SBC 2.5"
User's Manual

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Changes after the publication's first release will be based on the product's revision. The website will always provide the most updated information.

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Trademarks

Product names or trademarks appearing in this manual are for identification purpose only and are the properties of the respective owners.

FCC and DOC Statement on Class B

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio TV technician for help.

Notice:

1. The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
2. Shielded interface cables must be used in order to comply with the emission limits.

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Warranty

1. Warranty does not cover damages or failures that arise from misuse of the product, inability to use the product, unauthorized replacement or alteration of components and product specifications.
2. The warranty is void if the product has been subjected to physical abuse, improper installation, modification, accidents or unauthorized repair of the product.
3. Unless otherwise instructed in this user's manual, the user may not, under any circumstances, attempt to perform service, adjustments or repairs on the product, whether in or out of warranty. It must be returned to the purchase point, factory or authorized service agency for all such work.
4. We will not be liable for any indirect, special, incidental or consequential damages to the product that has been modified or altered.

Static Electricity Precautions

It is quite easy to inadvertently damage your PC, system board, components or devices even before installing them in your system unit. Static electrical discharge can damage computer components without causing any signs of physical damage. You must take extra care in handling them to ensure against electrostatic build-up.

1. To prevent electrostatic build-up, leave the system board in its anti-static bag until you are ready to install it.
2. Wear an antistatic wrist strap.
3. Do all preparation work on a static-free surface.
4. Hold the device only by its edges. Be careful not to touch any of the components, contacts or connections.
5. Avoid touching the pins or contacts on all modules and connectors. Hold modules or connectors by their ends.



Important:

Electrostatic discharge (ESD) can damage your processor, disk drive and other components. Perform the upgrade instruction procedures described at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

Safety Measures

To avoid damage to the system:

- Use the correct AC input voltage range.

To reduce the risk of electric shock:

- Unplug the power cord before removing the system chassis cover for installation or servicing. After installation or servicing, cover the system chassis before plugging the power cord.

About the Package

The package contains the following items. If any of these items are missing or damaged, please contact your dealer or sales representative for assistance.

- One FS051 board
- One terminal block for RS485
- One heat spreader (Height: 11mm)

Optional Items

- COM port cable (Length: 300mm, 2 x COM ports)
- USB 2.0 port cable (Length: 200mm, 2 x USB ports)
- Power cable for SATA and LCD backlight (Length: 155mm)
- Heat Sink (Height: 16.8mm)

The board and accessories in the package may not come similar to the information listed above. This may differ in accordance to the sales region or models in which it was sold. For more information about the standard package in your region, please contact your dealer or sales representative.

Before Using the System Board

Before using the system board, prepare basic system components.

If you are installing the system board in a new system, you will need at least the following internal components.

- Storage devices such as a SD card and hard disk drives, etc.

You will also need external system peripherals you intend to use which will normally include at least a keyboard, a mouse and a video display monitor.

Chapter 1 - Introduction

Specifications

SYSTEM	Processor	NXP i.MX6 Cortex-A9 DualLite, 1.0 GHz NXP i.MX6 Cortex-A9 Quad, 1.0 GHz
	Memory	1GB/2GB SDRAM Memory Down Single Channel DDR3L 1600MHz
	Flash	4MB NOR Flash
GRAPHICS	Display	1 x HDMI 1 x LVDS HDMI: resolution up to 1920x1080 @ 60Hz LVDS: single channel, resolution up to 1366x768 @ 60Hz
	Single/ Dual Displays	Yocto: HDMI or LVDS (default) Android: HDMI + LVDS (available upon request)
EXPANSION	Interface	1 x Full-size Mini PCIe (PCIe/USB) 1 x SD 1 x SIM (Option)
ETHERNET	Controller	1 x ATHEROS AR8033 Ethernet (10/100/1000Mbps)
I/O PORTS	Ethernet	1 x GbE (RJ-45)
	Serial	1 x RS-485 (2-wire)
	USB	2 x USB 2.0 1 x USB 2.0 OTG Port
	Display	1 x HDMI
	Power	1 x Power Button
I/O CONNECTORS	Serial	1 x RS-232 (4-wire) 1 x RS-232/422/485 (8-wire)
	USB	2 x USB 2.0
	Display	1 x LVDS LCD Panel Connector
	SATA	1 x SATA 2.0 (up to 3Gb/s) (Quad processor only)
	DIO	1 x 8-bit DIO
	eMMC	Supports 8GB, 16GB and 32GB eMMC onboard
WATCHDOG TIMER	CANBus	1 x CANBus
	Output & Interval	System Reset, Programmable via Software from 1 to 255 Seconds

POWER	Type	Single 5V +/-10% DC
	Connector	Terminal block (2 poles) DC Jack (available upon request)
	Consumption	Typical: 5V @ 0.460A (2.30Watt) Max.: 5V @ 0.963A (4.82Watt)
OS SUPPORT	Yocto (1.8, default preloaded on eMMC) Android (5.1.1)	
ENVIRONMENT	Temperature	Operating: 0 to 60°C / -20 to 70°C Storage: -40 to 85°C
	Humidity	Operating: 5 to 90% RH Storage: 5 to 90% RH
MECHANICAL	Dimensions	2.5" Pico-ITX Form Factor 100mm (3.94") x 72mm (2.83")
	Height	PCB: 1.6mm Top Side: 15.5mm, Bottom Side: 4mm

Features

- **DDR3L**

DDR3L SDRAM provides backward compatibility to DDR3 memory modules but can operate at the same or at a lower power level.

- **Storage**

The board features SD card and eMMC memory for storing system firmware. And with the i.MX6 Quad processor, an additional Serial ATA 2.0 port is provided for storing system and user data.

- **Gigabit LAN**

The Ethernet LAN is built around the Atheros AR8033 Ethernet controller (10/100/1000Mbps).

- **Power Failure Recovery**

When power returns after an AC power failure, you may choose to either power on the system manually or let the system power on automatically.

- **USB**

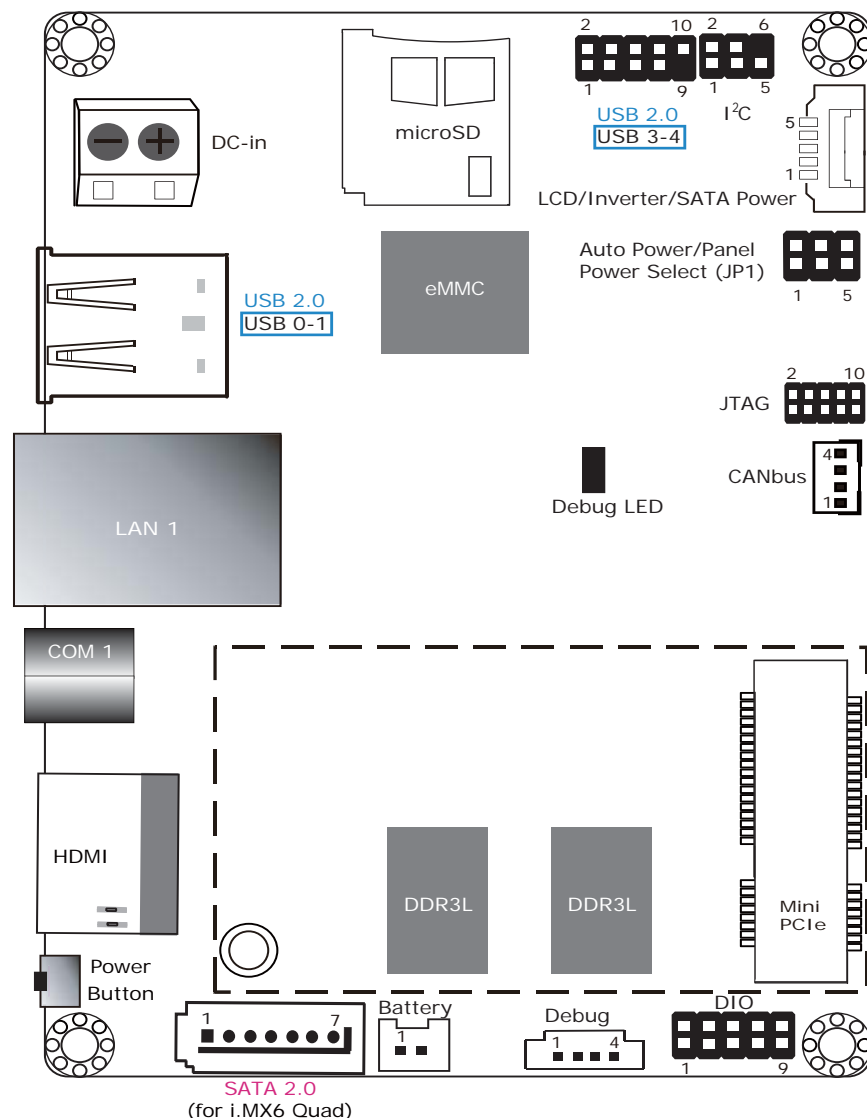
The system board supports the USB 2.0 to provide two USB host Type-A ports, one USB OTG port and one internal pin header for two additional USB ports.

- **CAN bus**

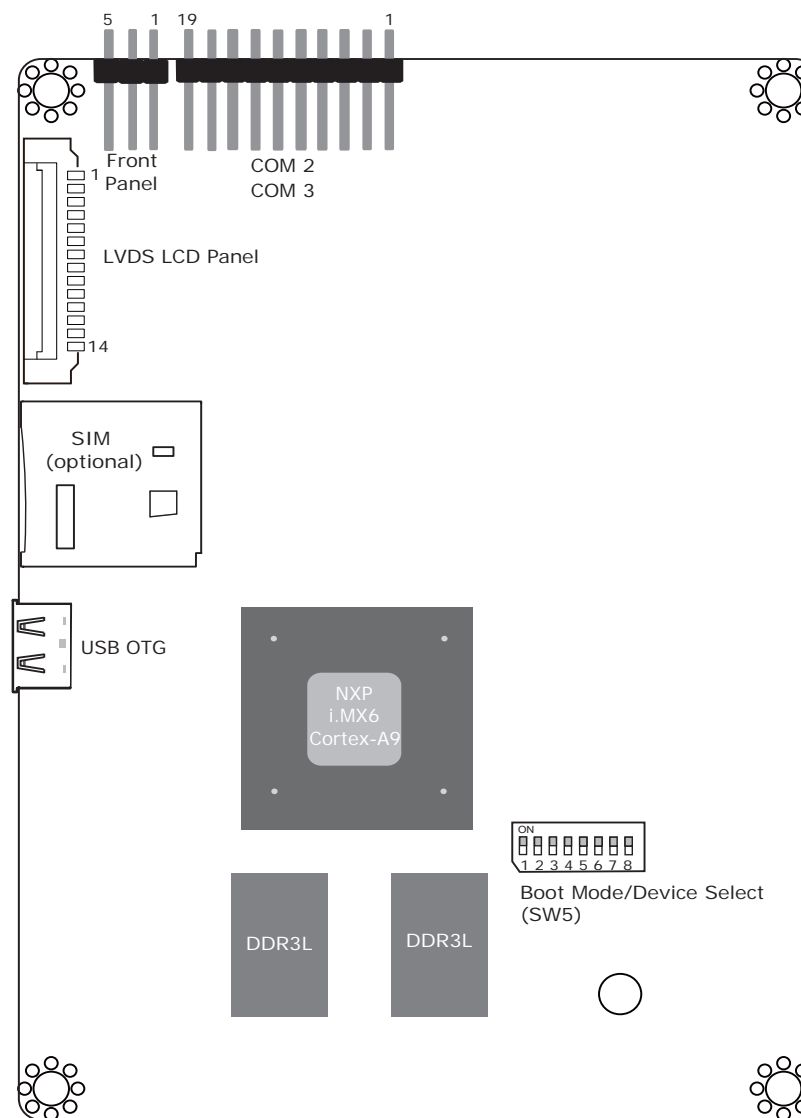
The onboard CAN (Controller Area Network) connector complies with CAN Version 2.0B and provides communication to CAN devices.

Chapter 2 - Hardware Installation

Board Layout

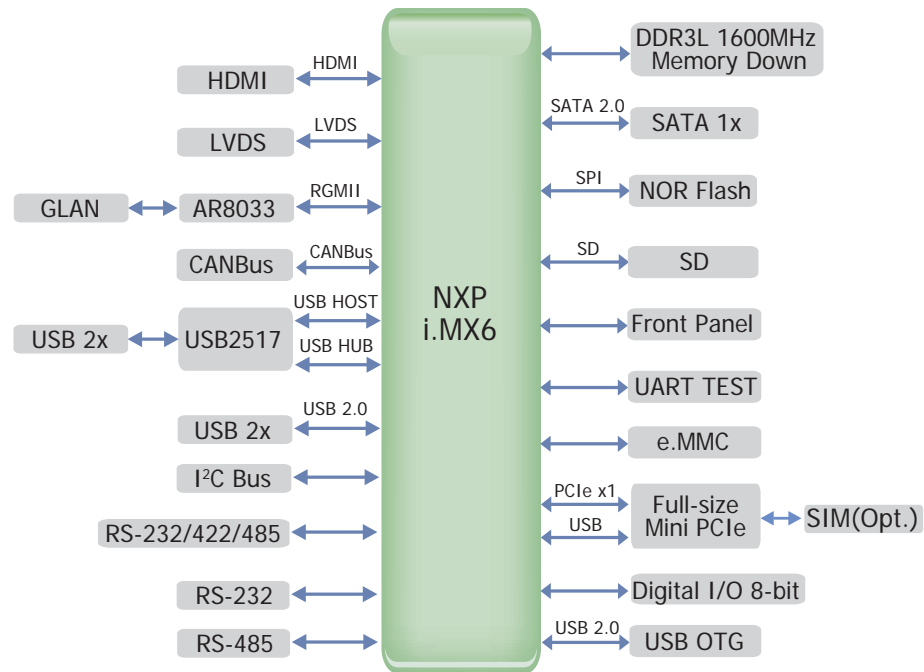


Top View

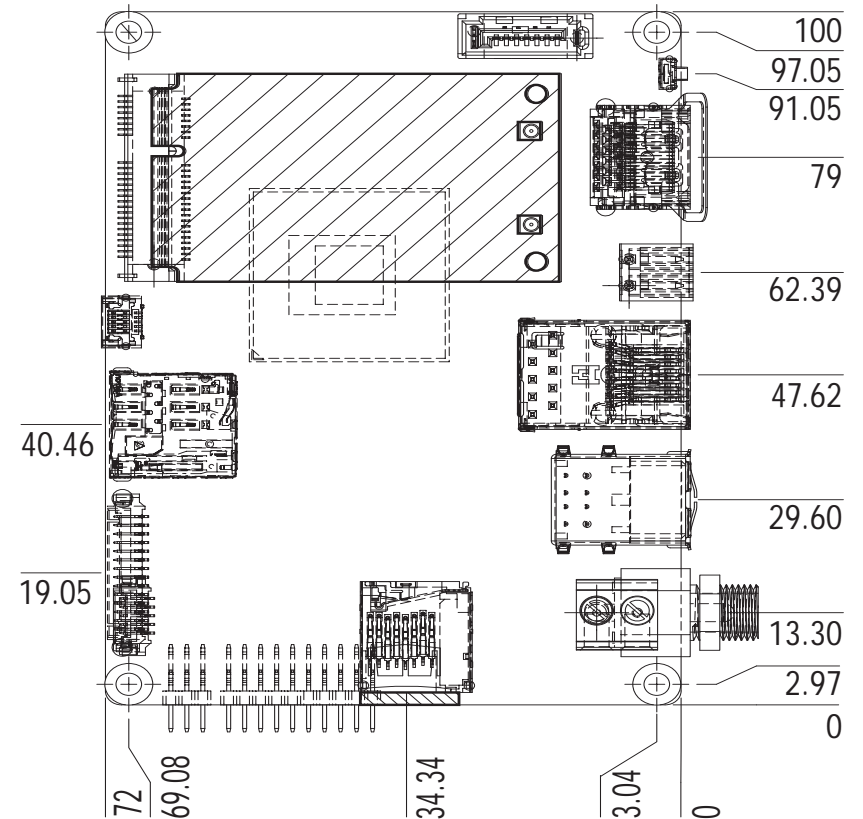


Bottom View

Block Diagram



Mechanical Diagram



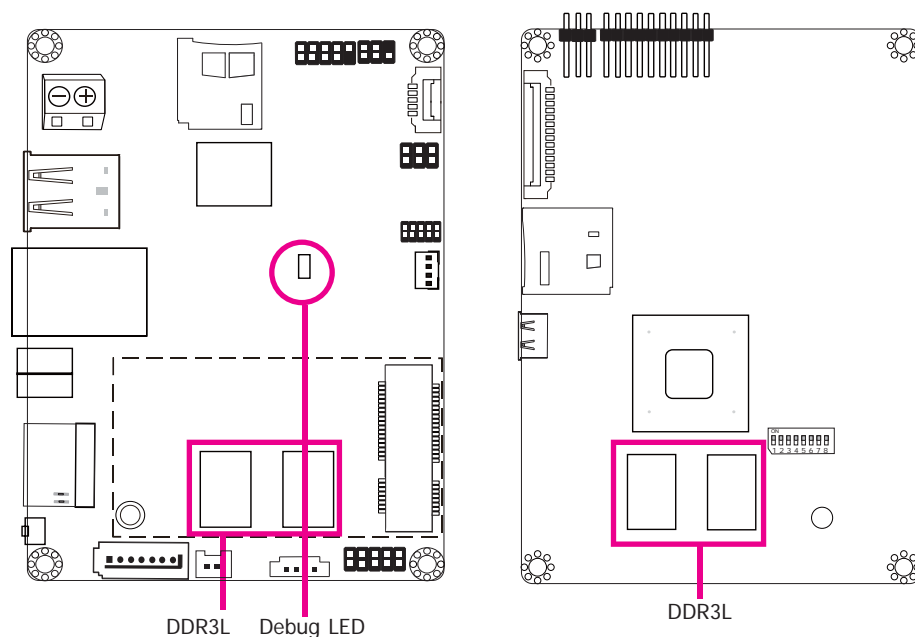
**Important:**

Electrostatic discharge (ESD) can damage your board, processor, disk drives, add-in boards, and other components. Perform installation procedures at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

System Memory

**Important:**

The Debug LED lights red until the operating system is being accessed. Power-off the PC then unplug the power cord prior to installing any devices. Failure to do so will cause severe damage to the motherboard and components.

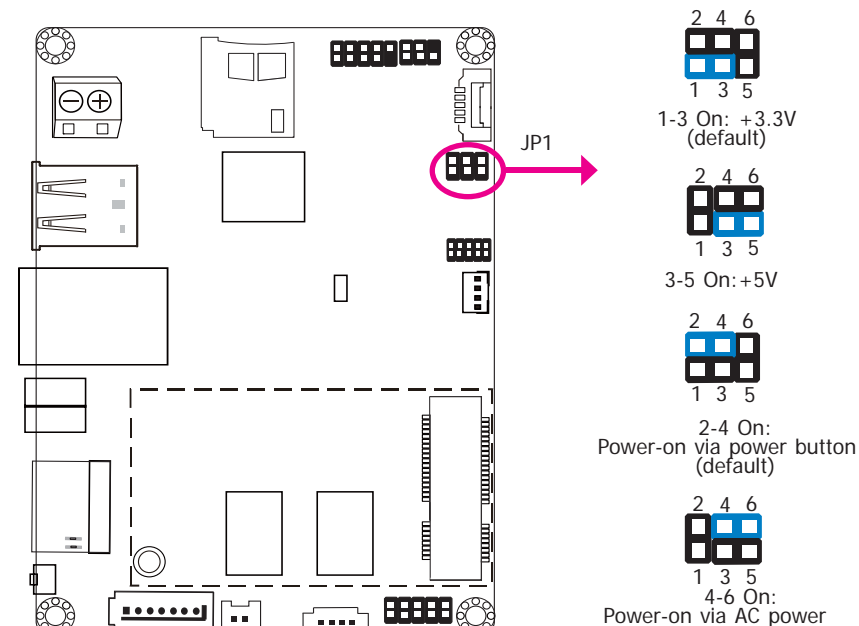


Features

- 1GB/2GB SDRAM Memory Down
- Single Channel DDR3L 1600MHz

Jumper Settings

Auto Power-on Select & Panel Power Select



JP1 is used to select the method of powering on the system. If you want the system to power on whenever AC power comes in, set JP1 pins 4 and 6 to On. If you want to use the power button, set pins 2 and 4 to On.

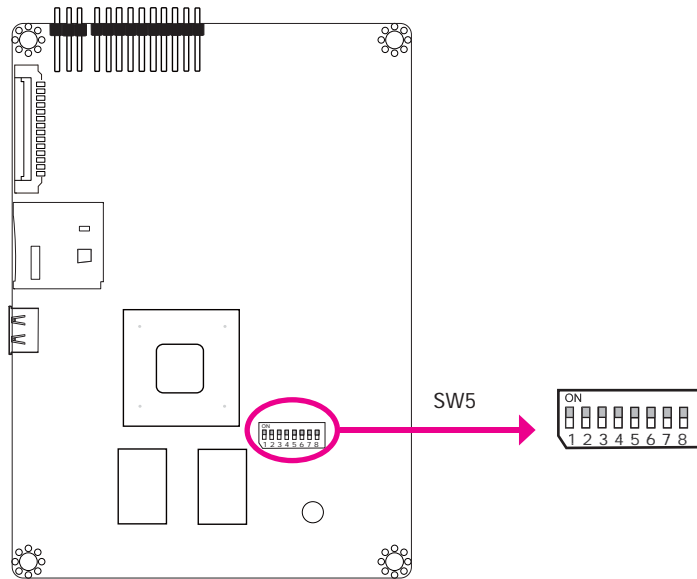
When using the JP1 "Power On" feature to power the system back on after a power failure occurs, the system may not power on if the power lost is resumed within 5 seconds (power flicker).

JP1 is also used to select the power supplied with the LCD panel.

**Important:**

Before powering-on the system, make sure that the power settings of JP1 match the LCD panel's specification. Selecting the incorrect voltage will seriously damage the LCD panel.

Boot Mode/Device Select



To select the boot mode and boot device, please use finger switch SW5.

Boot Mode Select	SW5
Boot from the fuses	7 Off, 8 Off
Serial downloader	7 On, 8 Off
Boot from the board settings (default)	7 Off, 8 On
Reserved	7 On, 8 On

Boot Device Select	SW5							
	1	2	3	4	5	6	7	8
eMMC	On	On	Off	Off	On	On	Off	On
SPI	xx	xx	xx	On	On	Off	Off	On
SD	On	Off	On	Off	Off	On	Off	On

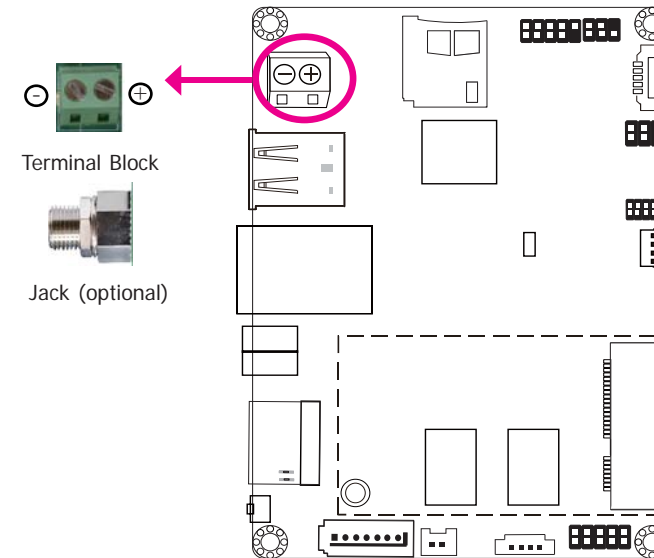
I/O Ports



The I/O ports consist of the following:

- One 5V DC-in 2-pin terminal block or jack (optional)
- Two USB 2.0 ports
- One LAN port
- One serial (RS-485) port
- One HDMI port
- One power button
- One USB 2.0 OTG port

5V DC-in

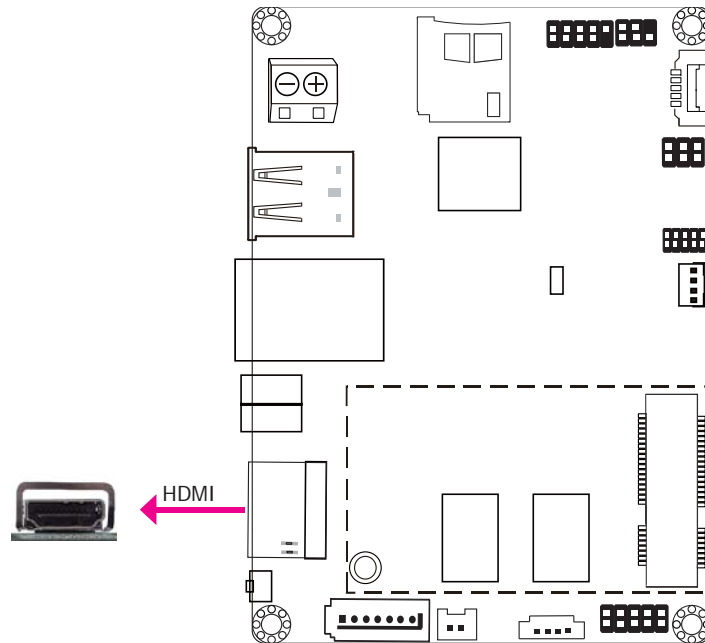


This 2-pin terminal block or jack (optional) is considered a low power solution. Connect a DC power cord to this terminal block or jack (optional). Using a voltage more than the recommended range may fail to boot the system or cause damage to the system board.

Graphics Interface

The display port consists of the following:

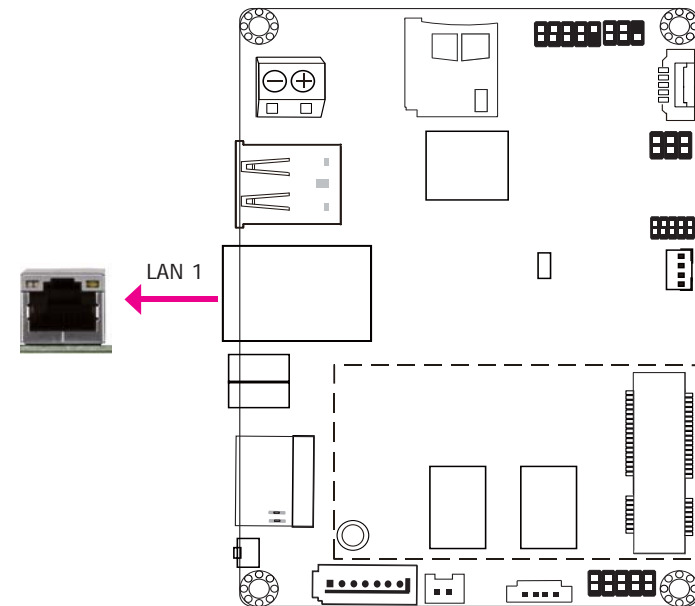
- 1 HDMI port



HDMI Port

The HDMI port carries video signals and is used to connect a LCD monitor or a digital TV that has a HDMI port.

RJ45 LAN Port

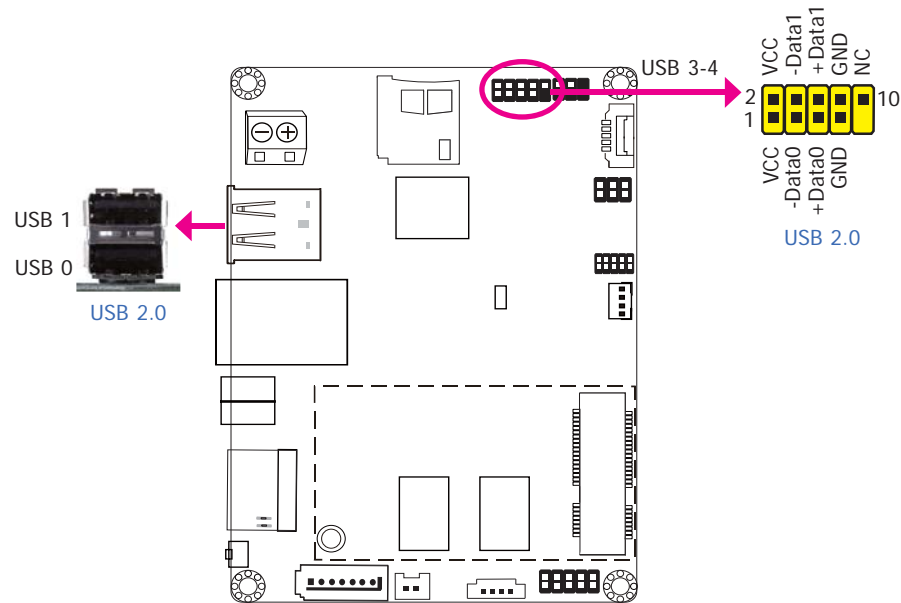


Features

- 1 RJ45 LAN port provided by Atheros AR8033 Ethernet controller (10/100/1000Mbps)

The LAN port enables the system board to connect to a local area network with a network hub.

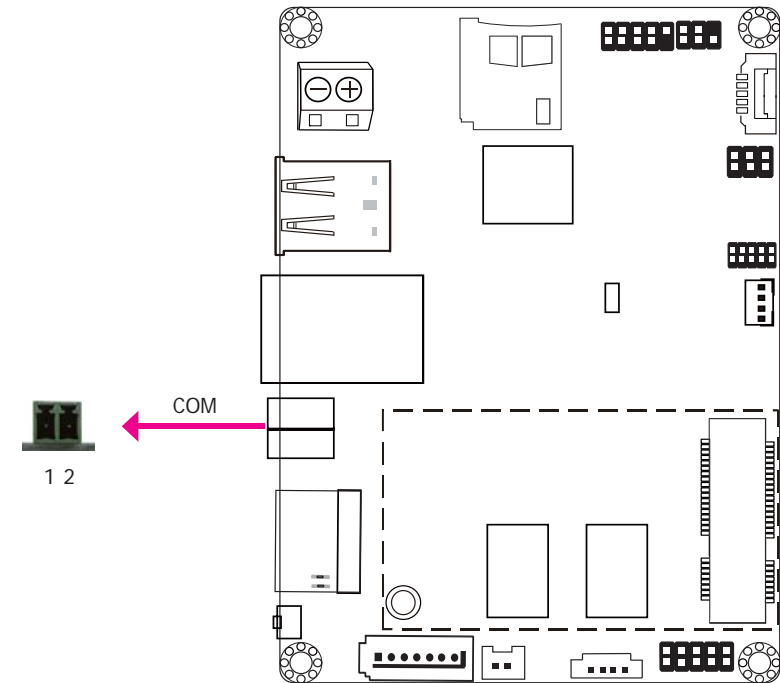
USB Ports



The USB device allows data exchange between your computer and a wide range of simultaneously accessible external Plug and Play peripherals.

The system board is equipped with 2 onboard USB 2.0 ports (USB 0-1). The 10-pin connector allows you to connect 2 additional USB 2.0 ports (USB 3-4). The additional USB ports may be mounted on a card-edge bracket. Install the card-edge bracket to an available slot at the rear of the system chassis and then insert the USB port cables to a connector.

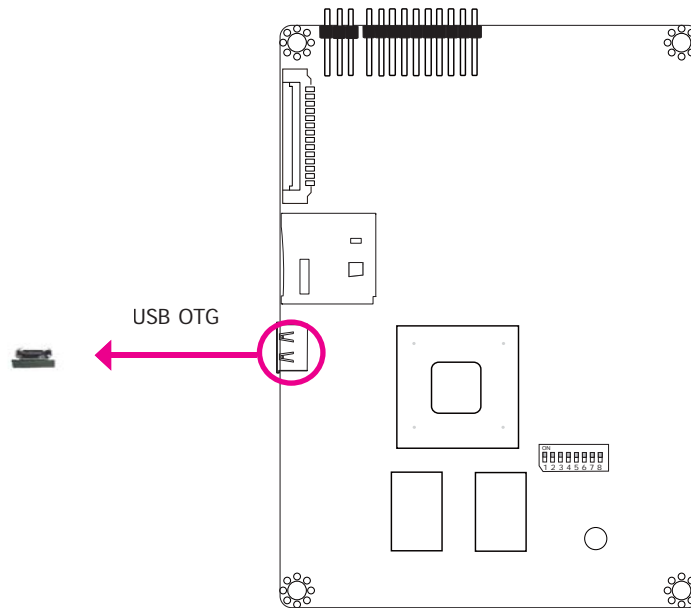
Serial Port



The serial port provides 2-wire RS485 communication with support of auto flow control.

Pin	Pin Name	Pin	Pin Name
1	RS485+	2	RS485-

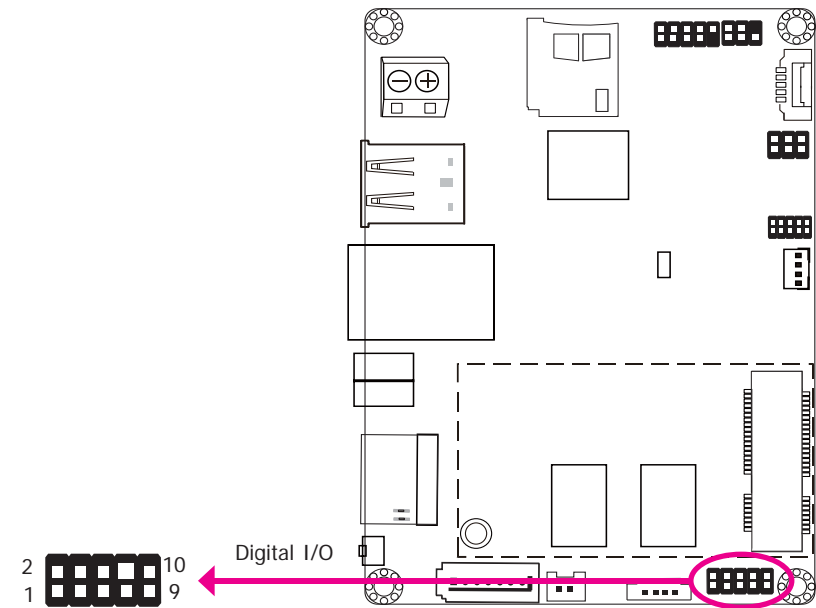
USB OTG Port



The USB OTG (USB 2.0) port is used for USB communication.

I/O Connectors

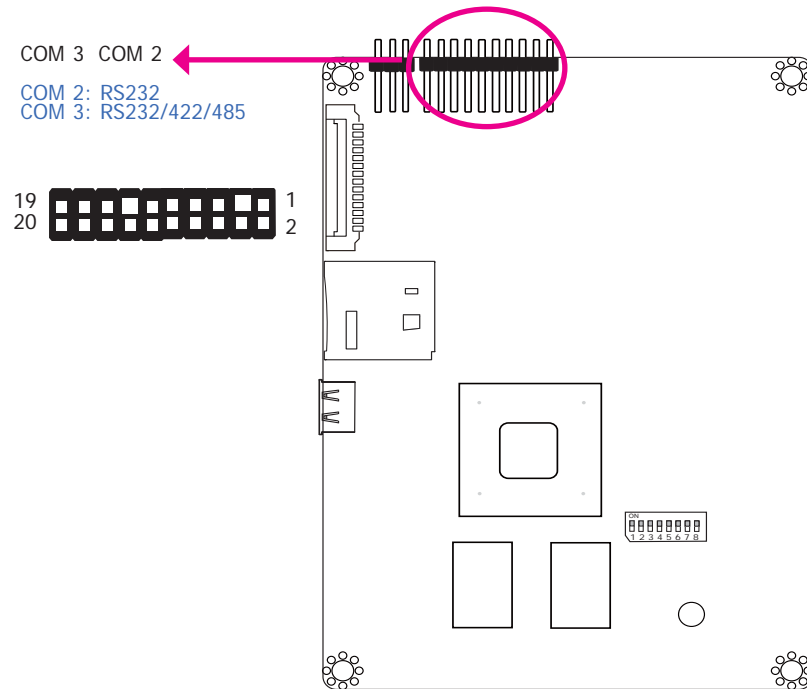
Digital I/O Connector



The Digital I/O connector supports 8-bit digital input/output signals to provide powering-on function of the connected devices.

Pin	Pin Name
1	DIO7
2	DIO6
3	DIO5
4	DIO4
5	DIO3
6	DIO2
7	DIO1
8	DIO0
9	5V
10	GND

COM (Serial) Ports



COM 2 is fixed at RS232 whereas COM 3 can be selected among RS232, RS422 and RS485. RS485 communication supports auto flow control.

The serial ports are asynchronous communication ports with 16C550A-compatible UARTs that can be used with modems, serial printers, remote display terminals, and other serial devices.

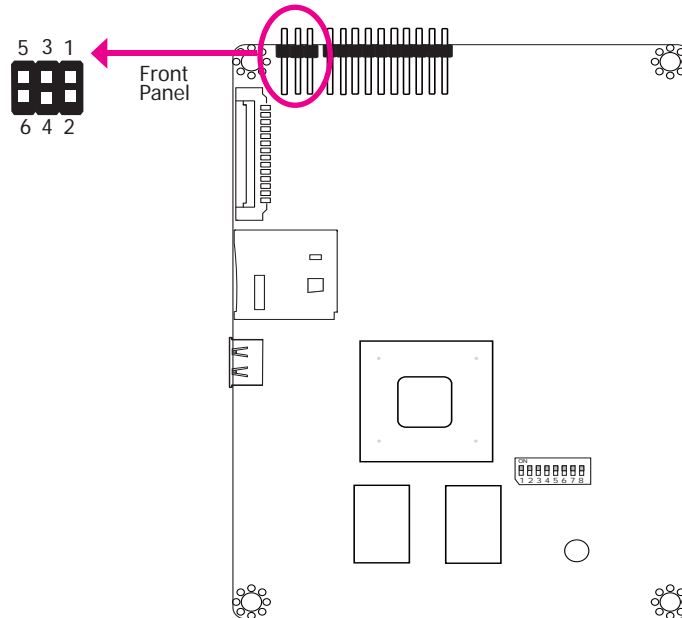
COM 2 Connector

Pins	RS-232
1	NC
2	NC
3	RX
4	RTS
5	TX
6	CTS
7	NC
8	NC
9	NC
10	NC

COM 3 Connector

Pins	RS-232 Full	RS-422	RS-485
11	MDCD2-	TX_B	R(B)/T(B)
12	MDSR2-	NC	NC
13	MSIN2-	TX_A	R(A)/T(A)
14	MRTS2-	NC	NC
15	MSO2-	RX_A	NC
16	MCTS2-	NC	NC
17	MDTR2-	RX_B	NC
18	MR12-	NC	NC
19	GND	NC	NC
20	NC	NC	NC

Front Panel Connector



Power Button

This switch is used to power on or off the system.

Reset Button

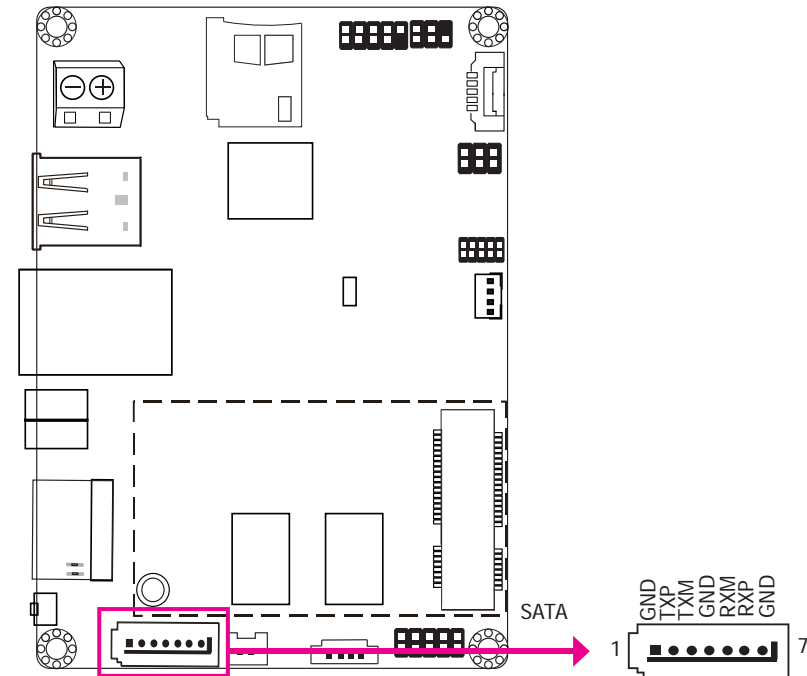
This switch allows you to reboot without having to power off the system.

Power_LED

This LED indicates power status.

Pin	Pin Name	Pin	Pin Name
1	Power Button	2	Power_LED
3	GND	4	NC
5	Reset Button	6	NC

SATA (Serial ATA) Connector (for i.MX6 Quad only)



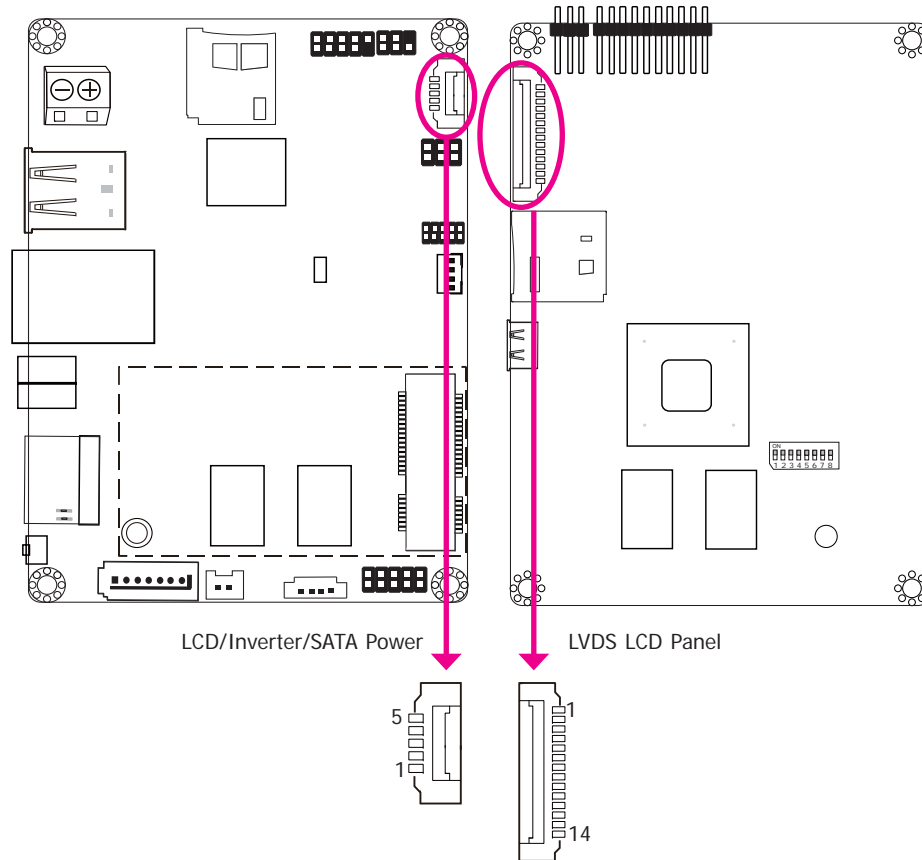
Features

- 1 Serial ATA 2.0 port with data transfer rate up to 3Gb/s

The Serial ATA connector is used to connect the Serial ATA device. Connect one end of the Serial ATA data cable to a SATA connector and the other end to your Serial ATA device.

LVDS LCD Panel Connector

Panel Backlight/SATA Power Connector



The system board allows you to connect a LCD Display Panel by means of the LVDS LCD panel connector and the Panel Backlight/SATA power connector. These connectors transmit video signals and power from the system board to the LCD Display Panel. Panel Backlight/SATA power connector also supplies power to the SATA drive. Connect one end of the provided power cable to the SATA power connector and the other end to your storage device.

Refer to the right side for the pin functions of these connectors.

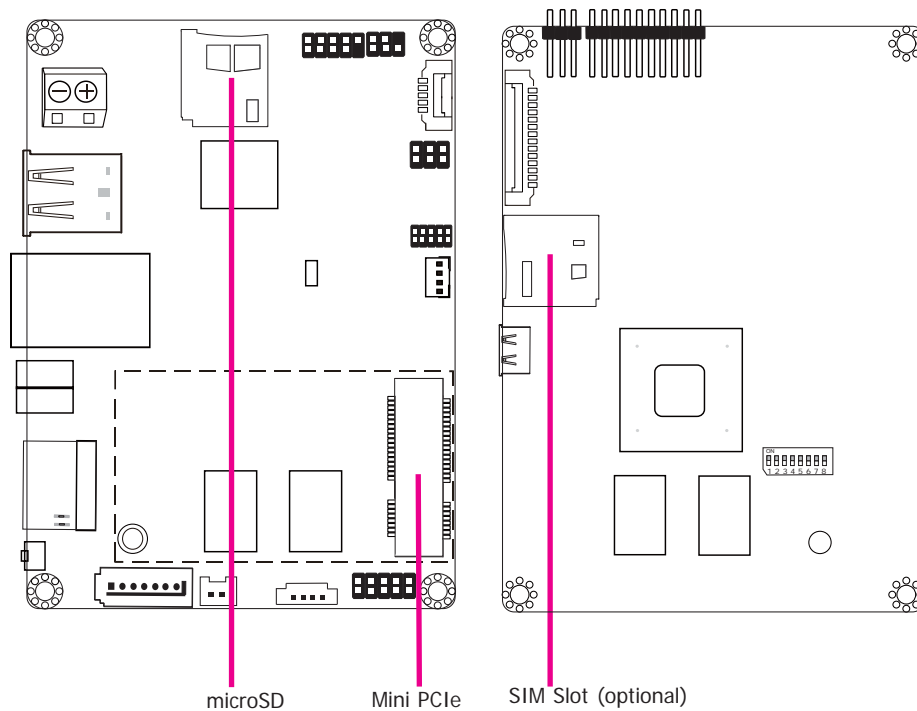
LVDS LCD Panel Connector

Pin	Pin Name	Pin	Pin Name
1	GND	2	GND
3	LVDS_CLK-	4	LVDS_CLK+
5	LVDS_Out3-	6	LVDS_Out3+
7	LVDS_Out2-	8	LVDS_Out2+
9	LVDS_Out1-	10	LVDS_Out1+
11	LVDS_Out0-	12	LVDS_Out0+
13	Panel Power	14	Panel Power

Panel Backlight/SATA Power Connector

Pin	Pin Name
1	Panel Backlight/SATA Power (+5V)
2	GND
3	Panel Backlight On/Off Control
4	Dimming Control
5	Panel Backlight/SATA Power (+5V)

Expansion Slots



Mini PCI Express Slot

The full-size Mini PCIe socket supports PCIe x1 signals and is used to install a Mini PCIe card.

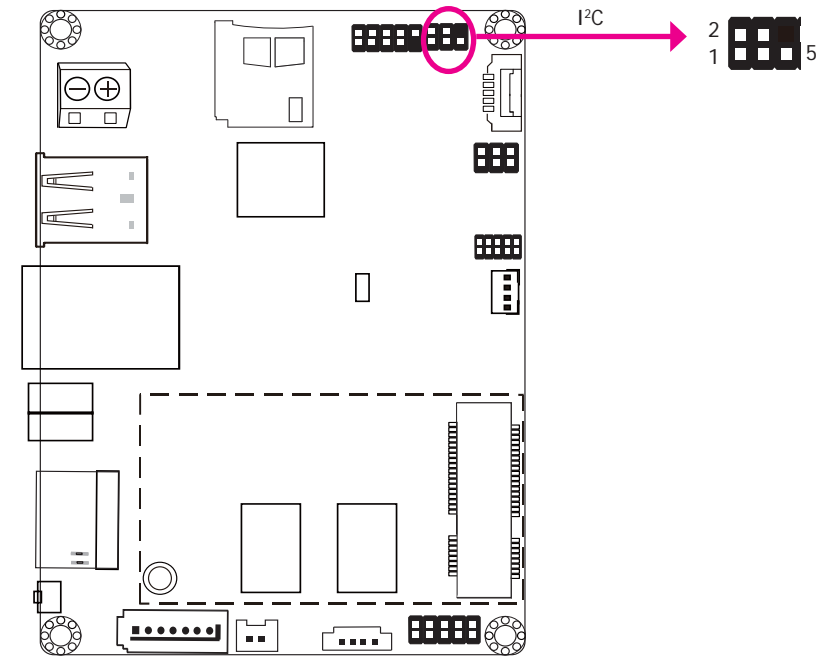
SIM Slot (optional)

The SIM slot on the system board is used to insert a SIM card and can be used in conjunction with the Mini PCI Express slot to provide mobile communication capability.

microSD Socket

The microSD socket allows you to install a microSD card for the expansion of available storage.

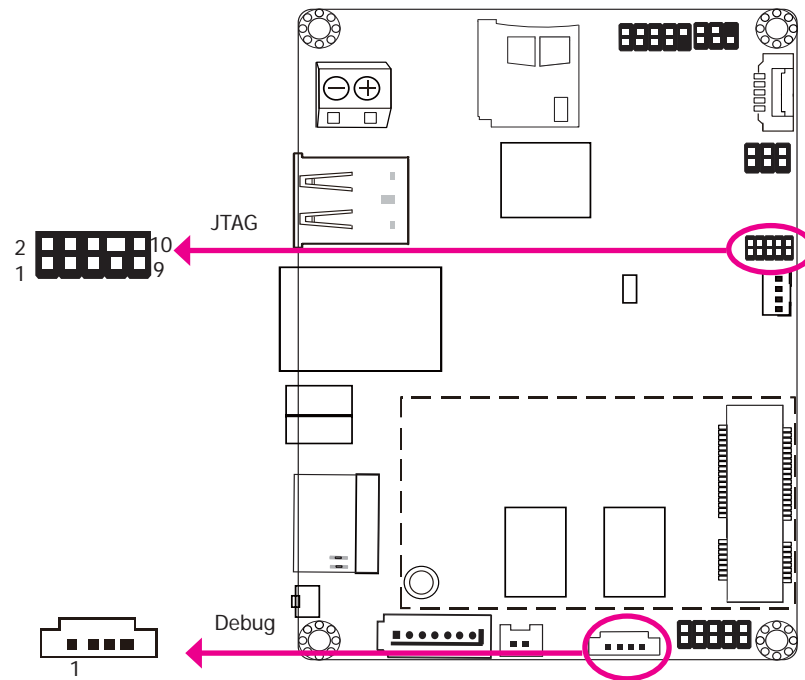
I²C Connector



The I²C connector is used to monitor or communicate with system components.

Pin	Pin Name
1	3.3V
2	GND
3	I2C_Clock
4	I2C_ALERT-
5	I2C_DATA

Debug Connectors



The JTAG and debug connectors are used for debugging purposes.

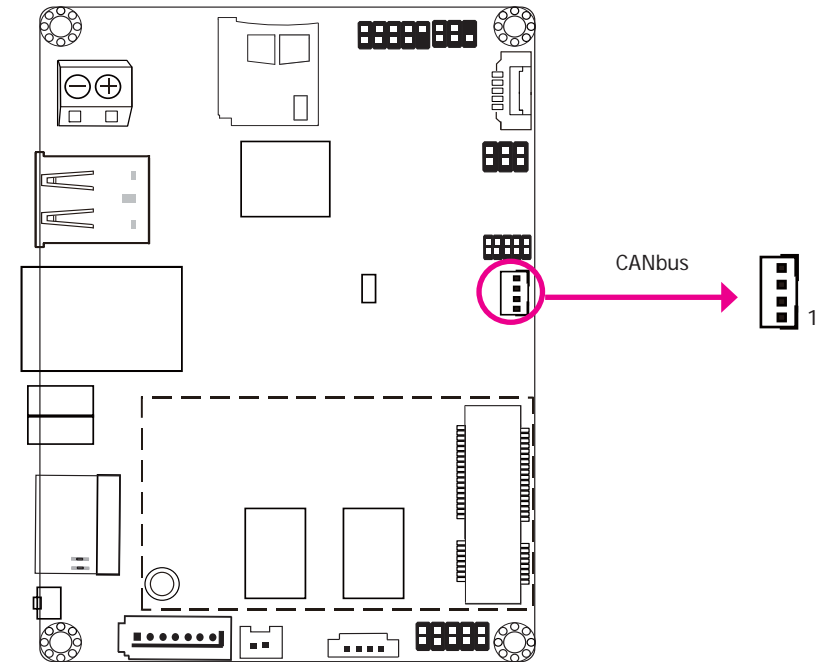
Debug Connector

Pin	Pin Name
1	3.3V
2	UART5_RX
3	UART5_TX
4	GND

JTAG Connector

Pin	Pin Name	Pin	Pin Name
1	3.3V	2	JTAG_TMS
3	GND	4	JTAG_TCK
5	GND	6	JTAG_TDO
7	JTAG_MOD	8	JTAG_TDI
9	JTAG_nTRST	10	JTAG_nRESET

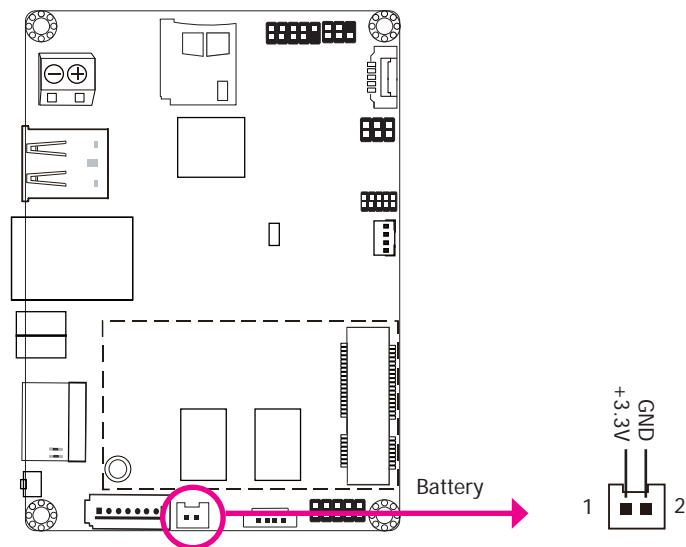
CANbus Connector



The CAN bus (Controller Area Network) connector is used for interconnecting electronic control units (ECUs).

Pin	Pin Name
1	3.3V
2	CAN1_H
3	CAN1_L
4	CAN1_GND

Battery Connector



Connect to the
battery connector

The lithium ion battery powers the real-time clock. It is an auxiliary source of power when the main power is shut off.

Safety Measures

- Danger of explosion if battery incorrectly replaced.
- Replace only with the same or equivalent type recommended by the manufacturer.
- Dispose of used batteries according to local ordinance.

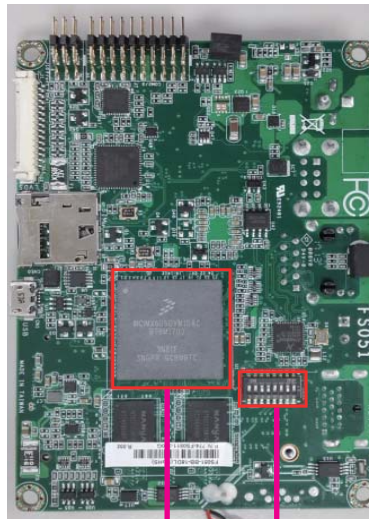
Chapter 3 - Software User Guide

Introduction

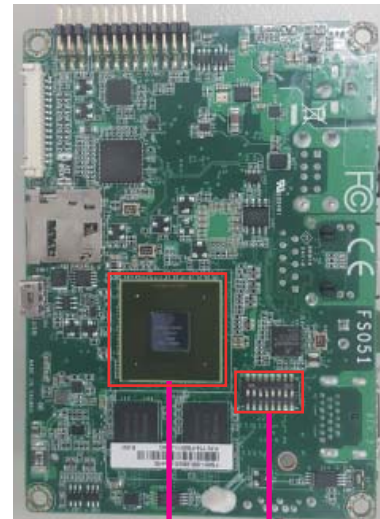
FS051 platform is an embedded system with Yocto 1.8 preloaded on eMMC. Demo images are supported under Yocto 1.8 and Android 5.1.1 environment.

Check Board Type

You will execute different files according to the CPU types. This section explains how to identify the boards with i.MX6 DualLite CPU and i.MX6 Quad CPU.



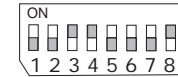
FS051 DualLite SW5



FS051 Quad SW5

Download Images to eMMC with MFGTool

1. Set the finger switch SW5 to "Serial Downloader Mode": pins 7 on and 8 off.

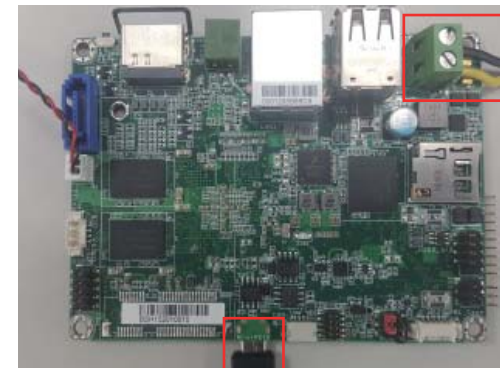


2. Plug in the Micro USB cable to your PC and power-on the FS051.



Important:

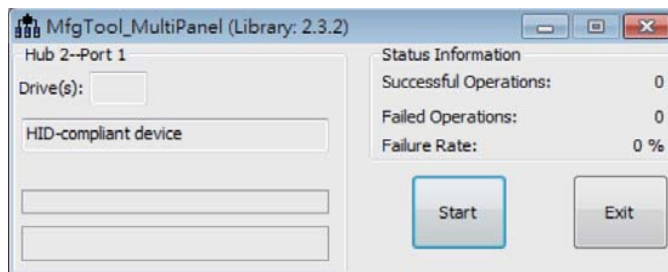
The adapter output voltage is 5V for FS051.



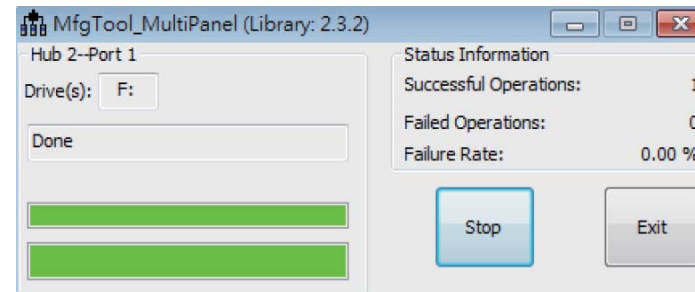
Micro USB Cable

3. Unzip Image package on your PC.
4. Yocto image: execute "\\[core type]\\yocto-emmc-fs051-[core type]-all.vbs".
For example, for DualLite CPU, execute "\\DualLite_core\\yocto-emmc-fs051-DualLite-all.vbs".

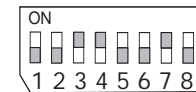
Android image: execute "\\[core type]\\android-emmc-fs051-[core type]-all.vbs".
For example, for DualLite CPU, execute "\\DualLite_core\\android-emmc-fs051-DualLite-all.vbs".
5. You will see the device connected as "HID-compliant device."
6. After all preparation is done, click "Start" to burn the file. Wait until the process ends.



7. After the burning is done, click "Stop" and turn the power off.



8. Set the finger switch SW5 to the "eMMC Start Mode": pins 1, 2, 5, 6, 8 on and 3, 4, 7 off.



9. Power-on the device again to reboot it into the system.

Download Uboot Images to SPI with MFGTool

1. First complete above "Download Images to eMMC with MFGTool" steps.
2. Set the finger switch SW5 to "Serial Downloader Mode": pins 7 on and 8 off.



3. Plug in the Micro USB cable to your PC and power-on the FS051.



Important:

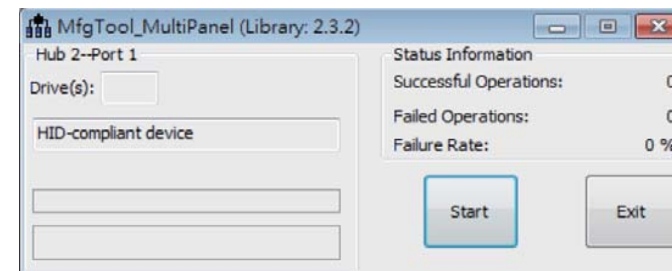
The adapter output voltage is 5V for FS051.



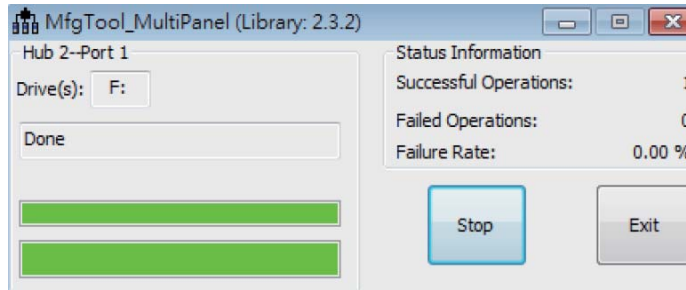
Micro USB Cable

4. Unzip Image package on your PC.
5. Yocto image: execute "\\[core type]\\yocto-spi-fs051_[core type]-u-boot.vbs".
For example, for DualLite CPU, execute "\\DualLite_core\\yocto-spi-fs051_DualLite-u-boot.vbs".

Android image: execute "\\[core type]\\android-spi-fs051_[core type]-u-boot.vbs".
For example, for DualLite CPU, execute
"\\DualLite_core\\android-spi-fs051_DualLite-u-boot.vbs".
6. You will see the device connected as "HID-compliant device."
7. After all preparation is done, click "Start" to burn the file. Wait until the process ends.



8. After the burning is done, click “Stop” and turn the power off.



9. Set the finger switch SW5 to the “SPI Start Mode”: pins 4, 5, 8 on and 6, 7 off.



10. Power-on the device again to reboot it into the system.

Download Images to SD Card with MFGTool

1. Set the finger switch SW5 to “SD Card Download Mode”: pins 1, 3, 6, 7 on and 2, 4, 5, 8 off.

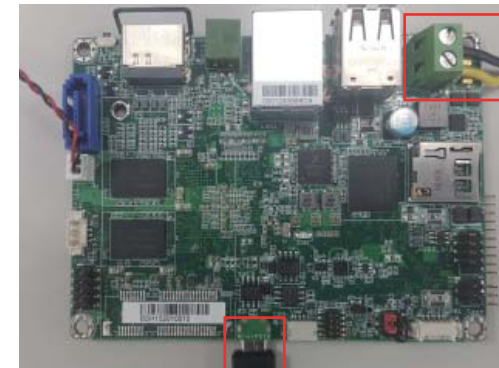


2. Plug in the Micro USB cable to your PC and power-on the FS051.



Important:

1. The adapter output voltage is 5V for FS051.
2. Do not insert SD card before turning on the device power.



Micro USB Cable

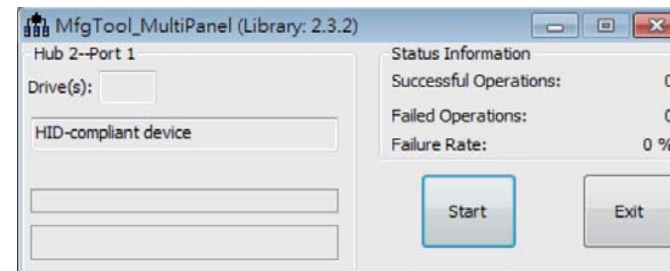
3. Unzip Image package on your PC.
4. Yocto image: execute "\\[core type]\\SDBoot\\yocto-sdcard-fs051-[core type]-all.vbs".
For example, for Quad CPU, execute "\\Quad_core\\SDBoot\\yocto-sdcard-fs051-Quad-all.vbs".

Android image: execute "\\[core type]\\SDBoot\\android-sdcard-fs051-[core type]-all.vbs".
For example, for Quad CPU, execute "\\Quad_core\\SDBoot\\android-sdcard-fs051-Quad-all.vbs".
5. You will see the device connected as "HID-compliant device."
6. Insert SD card.

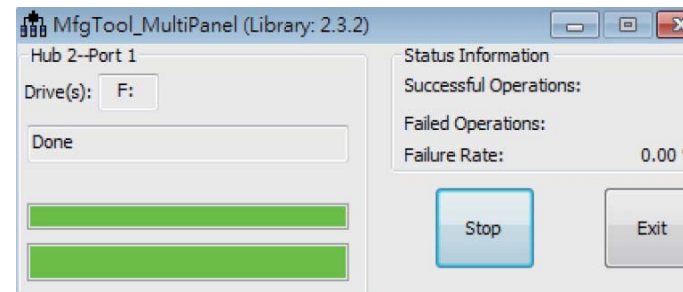


SD Card

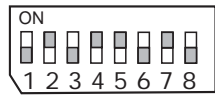
7. After all preparation is done, click "Start" to burn the file. Wait until the process ends.



8. After the burning is done, click "Stop" and turn the power off.



9. Set the finger switch SW5 to the “SD Card Start Mode”: pins 1, 3, 6, 8 on and 2, 4, 5, 7 off.



10. Power-on the device again to reboot it into the system.

Software Features

General Support

(*) is depended on the NXP support.

Component	Name	Base-Line Feature
General	OS Support	Yocto 1.8 - Kernel 3.14.52 (default preloaded on eMMC) Android 5.1.1 - Kernel 3.14.52
	Firmware Upgrade (*)	MFGTool firmware update tool
Misc	Utilities (*)	Hardware diagnostic utilities

Linux AP/API Support

(*) is depended on the NXP support.

Component	Description	Detail
Linux	Yocto 1.8 - Kernel 3.14.52	It is an open-source project that delivers a set of tools which create operating system images for embedded Linux systems. Support X-11 Demo Image Only (*)
Linux AP/API	NXP i.MX6 Yocto 1.8 BSP Support X11 Window Support BitBake build tool	All library and utility should support (*). Source code package (support by request)
	Support I ² C, Watchdog, GPIO, LVDS brightness control	Provide support console for i.MX6 platform
Android	Android 5.1.1 - Kernel 3.14.52	Support Demo Image
Android AP/API	NXP i.MX6 Android 5.1.1 NXP BSP Support Android AOSP launcher Support Android ADB shell Support Android APK install	All library, utility and Android apk should support (*). Source code package (support by request)
	Support I ² C, Watchdog, GPIO, LVDS brightness control	Provide support console for i.MX6 platform.

Yocto Support

(*) is depended on the NXP support.

Component	Support Status
Yocto Version	1.8
Kernel Version	3.14.52
Window System	X11 without QT5 build
eMMC	Support eMMC boot, eMMC v5.1, Linux ext3 file system
Ethernet LAN1	Support "ping", "ifconfig" console commands verify, static IP/DHCP Dynamic IP, fixed MAC address
USB 2.0	1. Support USB HID Keyboard and Mouse Device 2. Support USB Mass Storage by "mount" console command, EXT3/EXT4/ FAT filesystem
USB OTG	1. Support USB HID Keyboard and Mouse Device 2. Support USB Mass Storage by "mount" console command, EXT3/EXT4/ FAT filesystem 3. Support connect to PC to update image by i.MX6 MFGTool
LVDS Panel	Support single display function, resolution 1024x600, RGB24
LVDS Backlight	Support control by Linux device node, level value 0~7
HDMI Video Output	Support single display function, need to plug in HDMI cable before power on, resolution 1920x1080@60
DIO	Support read input voltage, set output voltage high/low status, control by Linux device node, 8 pins
Micro SD Card (SD Slot)	1. Support SD card boot, support SD storage by "mount" console command, FAT filesystem. (Support Kingston, micro SDHC 4GB class 4, 4GB/16GB) 2. For standard product, we do not port any SDIO module.
Mini PCIe	1. Support "lspci" console command for check PCIe card status. 2. For standard product, we only port ENLi AP12356 WiFi/BT module.
SATA (Quad)	1. Support mSATA storage only (by "mount" console command, EXT3/ EXT4/FAT filesystem). 2. For standard product, we do not port any mSATA module.
SIM Slot	N/A. For standard product, we do not port any 3G/4G phone module.

Component	Support Status
UART1 - RS232	Support Loopback & flow control test, BR 115200 (need DFI Linux user space utility)
UART1 - RS485	Support Loopback test, BR 115200 (need DFI Linux user space utility)
UART1 - RS422	Support Loopback test, BR 115200 (need DFI Linux user space utility)
UART2 - RS485	Support Loopback test, BR 115200 (need DFI Linux user space utility)
UART4 - RS232	Support Loopback & flow control test, BR 115200 (need DFI Linux user space utility)
SPI2 Nor-Flash	Support SPI2 Nor-Flash boot (Uboot image only)
RTC	Support linux "date -s" and "hwclock -w" console commands to set system time
Thermal Sensor	Support read device temperature (degrees C) by Linux device node
Debug Serial Port	Support read Linux kernel debug log by serial port, use PC serial terminal tool (ex. PuTTY), BR 115200
CAN Bus	Support "cansend", "candump" console commands for test send/read data
Play Video	Support play MPEG4 file (need DFI Linux user space utility).
Watchdog	Support NXP utility "wdt_driver_test.out"(*) to test Watchdog reboot function
Package Manager	N/A. For standard product, we do not build in package manager.

Android Support

(*) is depended on the NXP support.

Component	Support Status
Android Version	5.1.1
Kernel Version	3.14.52
eMMC	Support eMMC boot, eMMC v5.1, Linux ext4 file system
Ethernet LAN1	1. Support "ping", "ifconfig" console commands, and NXP Ethernet APP (*) 2. Support static IP/DHCP Dynamic IP, fixed MAC address
USB 2.0	1. Support USB HID Keyboard and Mouse Device 2. Support Android auto mount USB Mass Storage function (only one USB storage is available at a time. If second USB is plugged-in the USB cable, second USB is not available. If first USB is unplugged, second USB needs to be unplugged and re-plugged back to be available.) FAT32 filesystem only without multi-partition
USB OTG	1. Support USB HID Keyboard and Mouse Device 2. Support Android auto mount USB Mass Storage function (only one USB storage is available at a time. If second USB is plugged-in the USB cable, second USB is not available. If first USB is unplugged, second USB needs to be unplugged and re-plugged back to be available.) FAT32 filesystem only without multi-partition 3. Support connect to PC to update image by i.MX6 MFGTool
LVDS Panel	1. Support LVDS+HDMI dual display function. LVDS is main output, resolution 1024x600, RGB24 2. For Android standard product, we enable dual display function by default.
LVDS Backlight	1. Support Android->Settings->Display->Brightness level control without adaptive brightness function. 2. For standard product, we do not port any light sensor module.
HDMI Video Output	1. Default support LVDS+HDMI dual display function. HDMI is slave output, resolution 1024x600 (based on LVDS resolution). 2. If users want to change HDMI resolution (i.e. 1920x1080), users need to modify kernel parameter to change LVDS resolution to 1920x1080 too. 3. For Android standard product, we enable dual display function by default.
DIO	1. Support read input voltage, set output voltage high/low status, control by Linux device node, 8 pins 2. Support DFI Android GPIO demo APP (support by request)

Component	Support Status
Micro SD Card (SD Slot)	1. Support SD card boot, support SD storage by "mount" console command, FAT32 filesystem. (Support Kingston, micro SDHC 4GB class 4, 4GB/16GB) 2. Support Android auto mount SD card function (FAT32 filesystem only, without multi-partition) 3. For standard product, we do not port any SDIO module.
Mini PCIe	1. Support "busybox lspci" console command for check PCIe card status. 2. For standard product, we only port ENLi AP12356 WiFi/BT module.
SATA (Quad)	1. Support mSATA hard disk storage only 2. Support Android auto mount SATA function (FAT32 filesystem only, without multi-partition) 3. For standard product, we do not port any mSATA module.
SIM Slot	N/A. For standard product, we do not port any 3G/4G phone module.
UART1 - RS232	Support Loopback & flow control test, BR 115200 by DFI Android UART demo APP (supopr by request)
UART1 - RS485	Support Loopback test, BR 115200 by DFI Android UART demo APP (supopr by request)
UART1 - RS422	Support Loopback test, BR 115200 by DFI Android UART demo APP (supopr by request)
UART2 - RS485	Support Loopback test, BR 115200 by DFI Android UART demo APP (supopr by request)
UART4 - RS232	Support Loopback & flow control test, BR 115200 by DFI Android UART demo APP (supopr by request)
SPI2 Nor-Flash	Support SPI2 Nor-Flash boot (Uboot image only)
RTC	Support Android->Settings->Date to set system time function.
Thermal Sensor	Support read device temperature (degrees C) by Android CPU-Z APP installed by user
Debug Serial Port	Support read Linux kernel debug log by serial port, use PC serial terminal tool (ex. PuTTY), BR 115200
CAN Bus	Support "cansend", "candump" console commands for test send/read data
Play Video	Support play MPEG4 file by Android AOSP Gallery APP.
Watchdog	Support adb shell command "am hang --allow-restart" to test Watchdog reboot function

Component	Support Status
WiFi/BT	<ol style="list-style-type: none"> 1. Support AP12356 WiFi/BT module 2. AP12356 WiFi: <ol style="list-style-type: none"> (1) Support WiFi STA Mode (connect WiFi AP) by Android UI to enable/disable it. (2) Support Soft AP Mode (enable DHCP/IPv4 routing) by Android UI to enable/disable it. (3) Support Android UI to set up Soft AP information (4) Support Android Airplane mode to disable WiFi function (5) Not support STA mode and Soft AP mode enable at the same time (6) Not support other WiFi modes, i.e. Wi-Fi Direct, Miracast, Wi-Fi TimeSync, etc. (7) STA mode limitation: when plug-in wired LAN, STA mode will disconnect automatically by Android network framework limitation 3. AP12356 BT: <ol style="list-style-type: none"> (1) Support BT connected and enable/disable by Android UI (2) Support BT files transfer by OPP profile using "Bluetooth File Transfer" tool. (3) Support OPP, FTP, OBEX, SDAP profile only (4) Not support other BT profiles which are not listed above (5) Support Android Airplane mode to disable BT function
Android Build Type	ENG Build without SELinux
Android ADB	Support
Android Factory Reset	Support
Android Fastboot	Not support
Android OTA	Not support
Android CTS	Not support
Android GMS/GTS	Not support
Android Suspend	Not support suspend, set never to suspend by default. The power key supports suspend function on FS051 device.

Component	Support Status
Preload Android APPs	<ol style="list-style-type: none"> 1. AOSP Browser: Web Browser 2. AOSP Calculator: Calculator APP 3. AOSP Calendar: Calendar APP 4. AOSP Clock: Clock APP, support alarm wake-up 5. AOSP Contacts: function not ready, preload for 3G module test in the future 6. AOSP Dev Tools: develop test tool 7. AOSP Downloads: show downloads APP 8. AOSP Email: E-Mail APP 9. AOSP Gallery: Gallery APP (JPEG) 10. AOSP Messaging: Short Message Service (SMS) APP. Function not ready, preload for 3G module test in the future. 11. AOSP Music: Play music APP (MP3) 12. AOSP Phone: function not ready, preload for 3G module test in the future. 13. AOSP Settings: Android Settings APP 14. AOSP Sound Recorder: Sound Recorder APP. Function not ready, preload for AOSP Audio module test in the future 15. NXP Audio Route (*): function not ready, preload for Audio module test in the future. 16. NXP Ethernet (*): Ethernet settings APP. 17. Open-source Simple Explorer: File Explorer APP