M93053

2.5" SBC

User's Manual

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FCC and DOC Statement on Class A

This equipment has been tested and found to comply with the limits for a Class A 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.

About this Manual

This manual can be retrieved from the website.

The manual is subject to change and update without notice, and may be based on editions that do not resemble your actual products. Please visit our website or contact our sales representatives for the latest editions.

Warranty

1. Warranty does not cover damages or failures that arises 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.

About this 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.

- 1 M93053 board
- 1 Terminal block for RS485 (COM3)
- 1 Heat spreader (Height: 11mm)

Note: The items are subject to change in the developing stage.
The product and accessories in the package may not come similar to the information listed above. This may differ in accordance with 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.

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 Precautions

*   Use the correct DC / AC input voltage range.

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

*   There is danger of explosion if battery incorrectly replaced.

*   Replace only with the same or equivalent specifications of batteries recommend by the manufacturer.

*   Dispose of used batteries according to local ordinance.

*   Keep this system away from humid environments.

*   Make sure the system is placed or mounted correctly and stably to prevent the chance of dropping or falling may cause damage.

*   The openings on the system shall not be blocked and shall be kept in distance from

other objects to make sure of proper air ventilation to protect the system from overheating.

*   Dress the cables, especially the power cord, so they will not be stepped on, in contact with high temperature surfaces, or cause any tripping hazards.

*   Do not place anything on top of the power cord. Use a power cord that has been approved for use with the system and is compliant with the voltage and current ranges required by the system's electrical specifications.

*   If the system is to be unused or stored for a long time, disconnect it from the power source to avoid damage by transient overvoltage.

*   If one of the following occurs, consult a service personnel:

    - The power cord or plug is damaged.

    - Liquid has penetrated the system.

    - The system has been exposed to moisture.

    - The system is not working properly.

    - The system is physically damaged.

*   The unit uses a three-wire ground cable which is equipped with a third pin to ground the unit and prevent electric shock. Do not defeat the purpose of this pin. If your outlet does not support this kind of plug, contact your electrician to replace the outlet.

*   Disconnect the system from the electricity outlet before cleaning. Use a damp cloth for cleaning the surface. Do not use liquid or spray detergents for cleaning.

*   Before connecting, make sure that the power supply voltage is correct. The device is connected to a power outlet which should be grounded connection.

The system may burn fingers while running.

Wait for 30 minutes to handle electronic parts after power off.

Table of Contents

Chapter 1 - Introduction

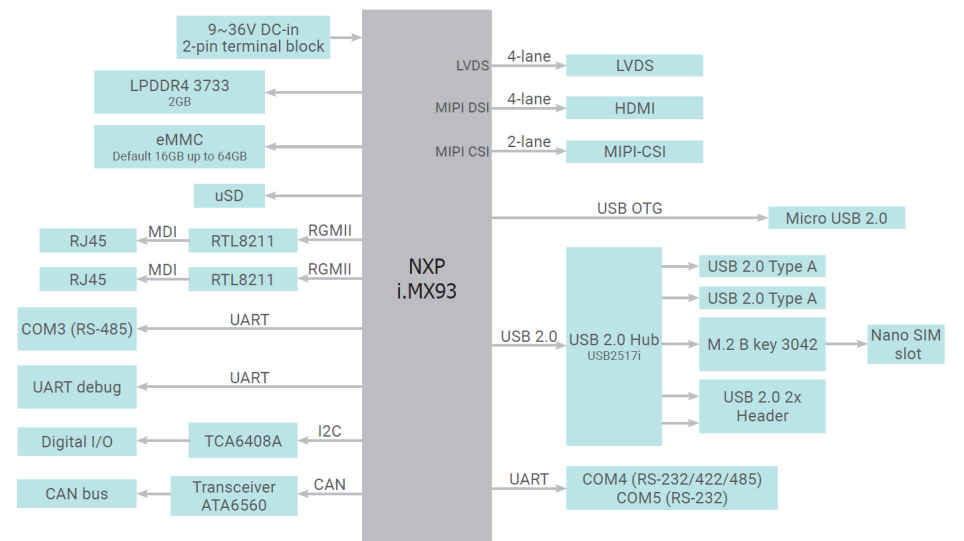## ▶ Specifications

SYSTEM	Processor	i.MX 93 applications processor MIMX9352CVVXMAB, Dual core, 1.7GHz, NPU, -40°C~105°C
	Memory	2GB LPDDR4 Memory Down
GRAPHICS	Controller	2D Graphics: PXP Engine
	Feature	Blending/Composition, Resize, Color Space Conversion
	Display	1 x HDMI 1.4 HDMI: resolution up to 1920x1080 @60Hz 1 x LVDS LVDS: resolution up to 1366x768 @60Hz
	Single Display	LVDS or HDMI
STORAGE	eMMC	1 x eMMC 5.1 with default 16GB (up to 64GB)
EXPANSION	Interface	1 x M.2 B key 3042 (USB 2.0) 1 x Nano SIM slot
ETHERNET	Phy	RTL8211
REAR I/O	Ethernet	2 x GbE (RJ-45)
	Serial	1 x RS485 (2-wire)
	USB	2 x USB 2.0 1 x Micro USB 2.0 (OTG)
	Display	1 x HDMI
	Download Mode Switch	1 x Download mode switch
INTERNAL I/O	Serial	1 x RS232, 1x RS232/422/485 on 2x6 header
	Camera	1 x MIPI-CSI for 2-lanes camera, reference to RPI-CAM-MIPI Camera adapter (AR0144 Sensor)
	USB	2 x USB 2.0
	Display	1 x LVDS LCD Panel connector (Default: 12V/Opt.: 5V) 1 x LCD Backlight Power (Default: 5V/Opt.: 3.3V)
	SD	1 x uSD card
	DIO	1 x 8-bit DIO
	I²C	1 x I2C / Touch
	CANBus	1 x CAN bus 2.0b
	Others	1 x SPI, 1 x Front Panel, 1 x UART debug

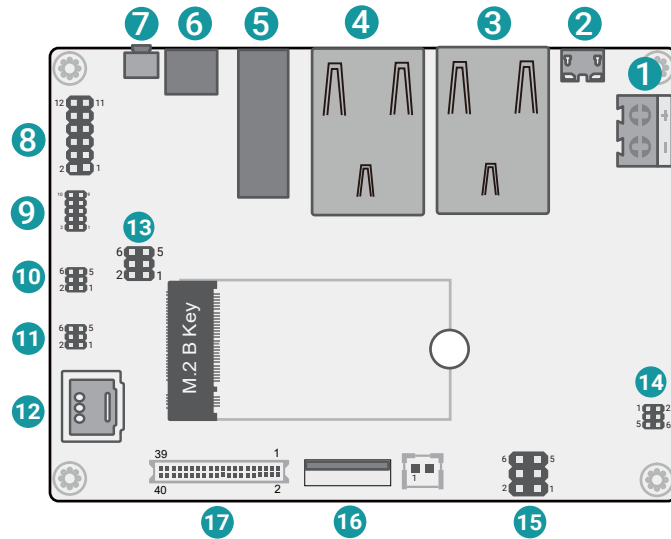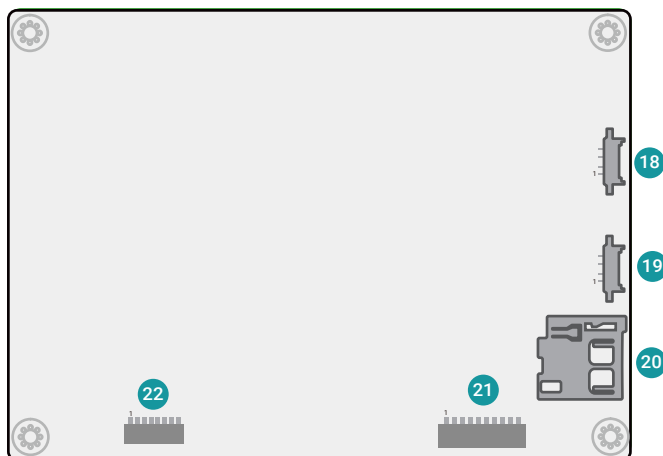| WATCHDOG TIMER	Output & Interval	System Reset, Programmable via Software from 1 to 255 Seconds
POWER	Type	Wide Range 9~36VDC
	Connector	2-pole terminal block
	Consumption	TBC
	RTC Battery	CR2032 Coin Cell
OS SUPPORT	Linux	Linux Yocto 4.2 (Kernel 6.1.36)
MECHANISM	Dimensions	2.5" SBC Form Factor 100mm (3.94") x 72mm (2.83")
	Height	PCB: 1.6mm Top Side: TBC Bottom Side: TBC
ENVIRONMENT	Temperature	Operating: -5 to 65°C, (-30°C ~ 80°C, TBC) Storage: -40 to 85 °C
	Humidity	Operating: 5 to 90% RH Storage: 5 to 90% RH
	MTBF	MIMX9352CVVXMAB, Dual core: 778,719 hrs @ 25°C; 497,925 hrs @ 45°C ; 331,500 hrs @ 60°C; 247,941 hrs @ 70°C Calculation model: Telcordia Issue 4 Environment: GB, GC – Ground Benign, Controlled
STANDARDS AND CERTIFICATIONS	Certifications	CE, FCC, RoHS, UKCA

▶ **Dimensions**
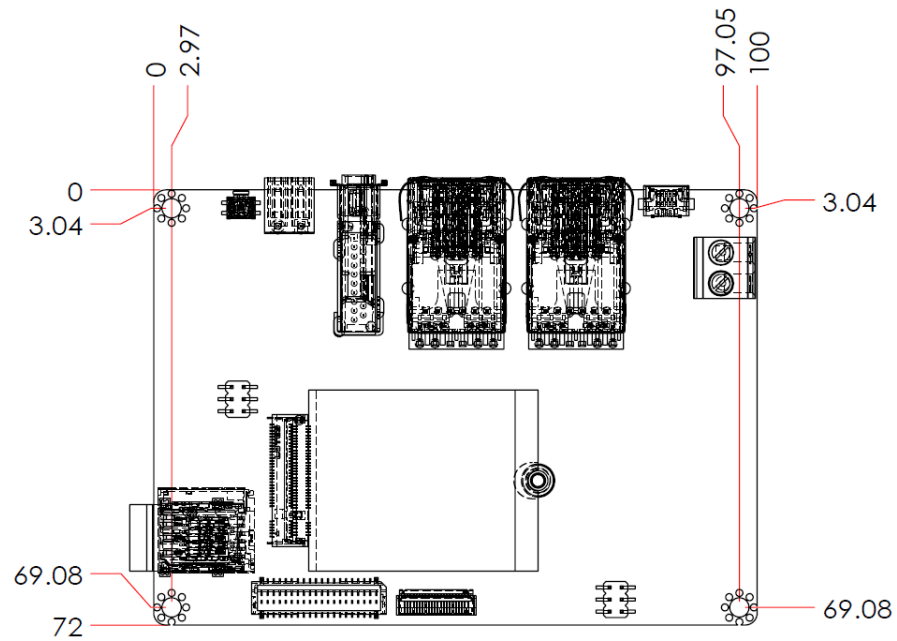
▶ **Block Diagram**

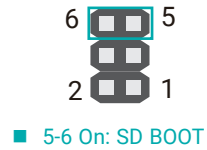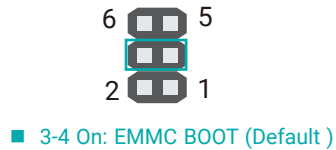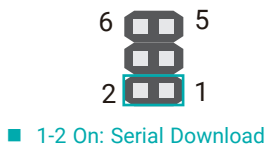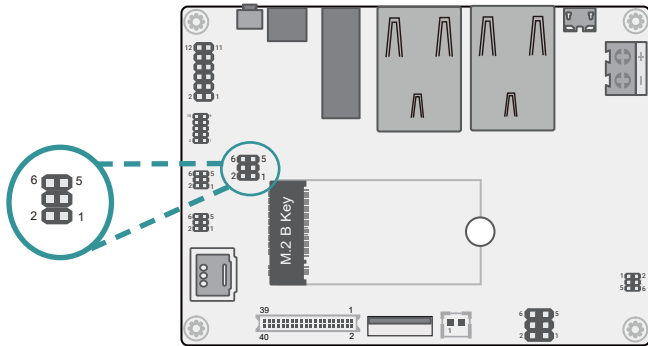# Chapter 2 - Hardware Installations

▶ Overview

Top View

Bottom View

1	Power DC in		11	Front Panel
2	Micro USB 2.0 (OTG)		12	Nano SIM Slot
3	LAN (CN1, ETH1)		13	Boot Mode Select
4	LAN (CN2, ETH0)		14	SPI
5	HDMI		15	Backlight Power Select
6	COM3 (RS-485)		16	MIPI-CSI
7	Download Mode Switch		17	LVDS
8	COM5 & COM4		18	CAN Bus
9	USB2.0		19	UART Debug
10	I2C Touch		20	uSD Card
			21	Digital I/O
			22	LCD BackLight Power

▶ **Jumper Settings**

Boot Mode Select (JP1)

Backlight Power Select (BLJP1)

■ 1-2 On: Serial Download

■ 3-4 On: EMMC BOOT (Default)

■ 5-6 On: SD BOOT

■ 1-3 On: 5V (Default)

■ 1-2 On: 3V3

■ 4-6 On: 5V

■ 5-6 On: 12V (Default)
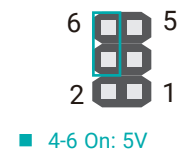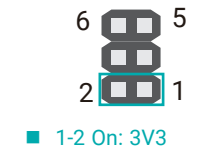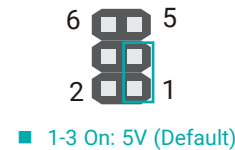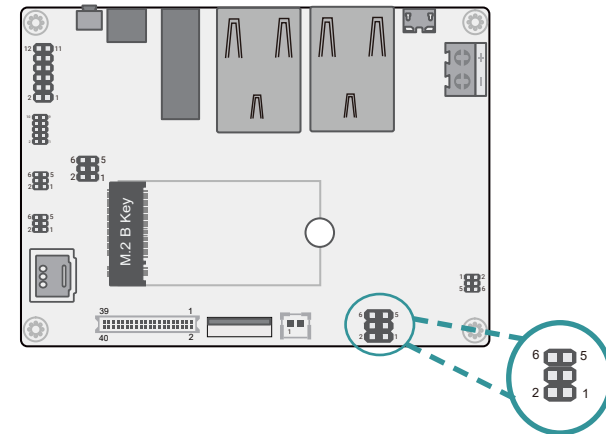
▶ **Pin Assignment**

CAN Bus (CBCN1)

LCD BackLight Power (BLJ1)
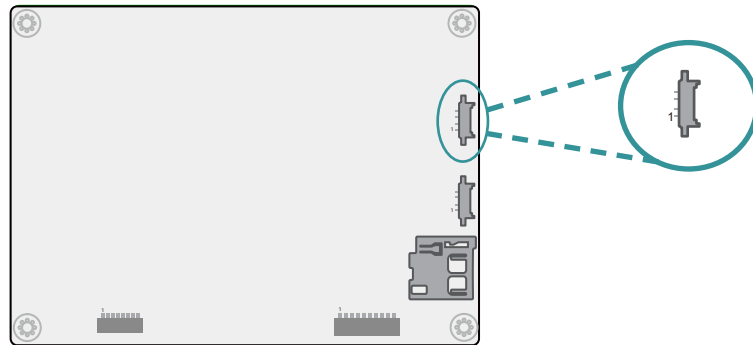
Pin	Assignment
1	5V
2	CAN1H
3	CAN1L
4	GND
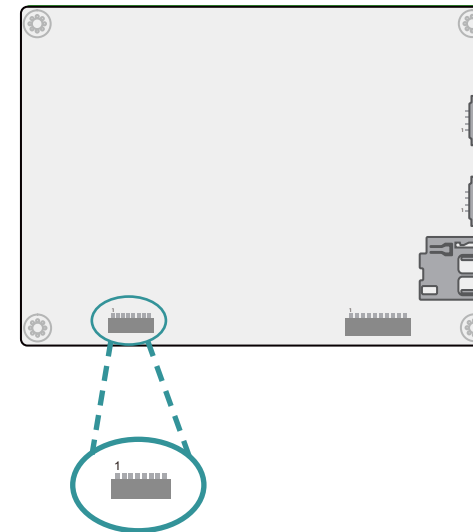
Pin	Assignment
1	DIMMING
2	GND
3	BLONOFF
4	GND
5	GND
6	12V/5V
7	12V/5V
8	12V/5V

DIO (TSJ1)
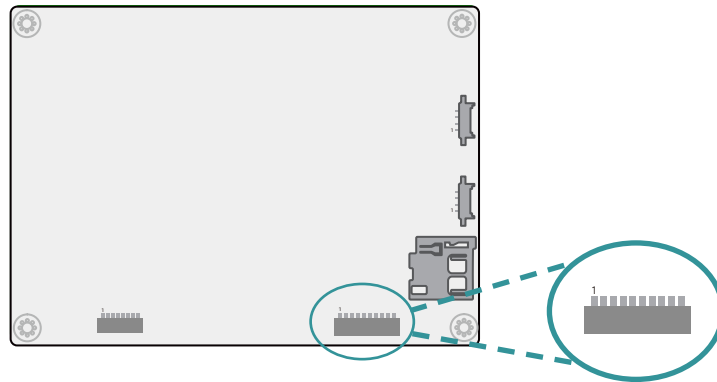
Pin	Assignment
1	DIO0
2	DIO1
3	DIO2
4	DIO3
5	DIO4
6	DIO5
7	DIO6
8	DIO7
9	5V
10	GND

SPI (SPJP1)
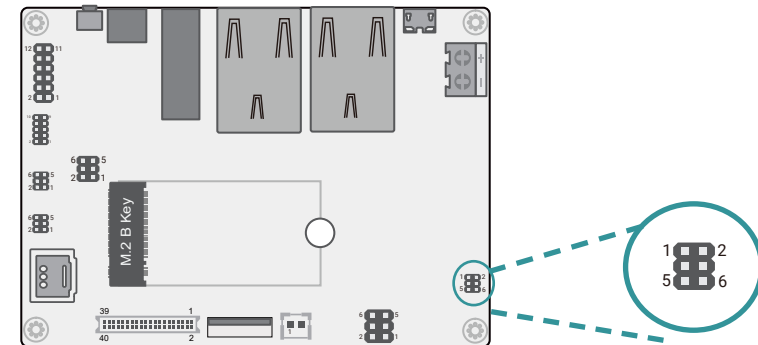
Pin	Assignment	Pin	Assignment
1	SPI_SCLK	2	3V3
3	SPI_MOSI *MOSI is actually SOUT	4	SPI_SS0
5	SPI_MISO *MISO is actually SIN	6	GND

I2C Touch (TPJP1)
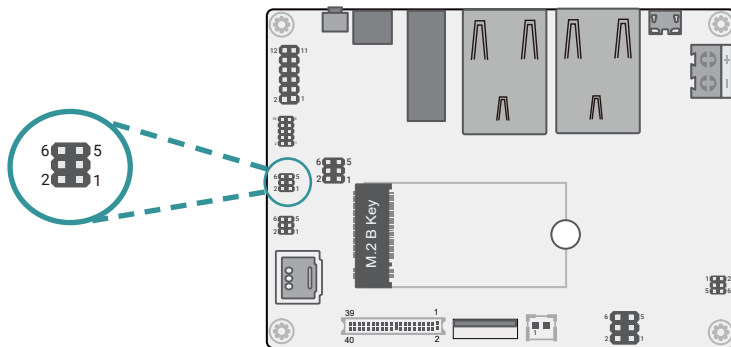
Pin	Assignment	Pin	Assignment
1	3V3	2	GND
3	SCL	4	ALERT
5	SDA	6	RST

Front Panel (FPJP1)
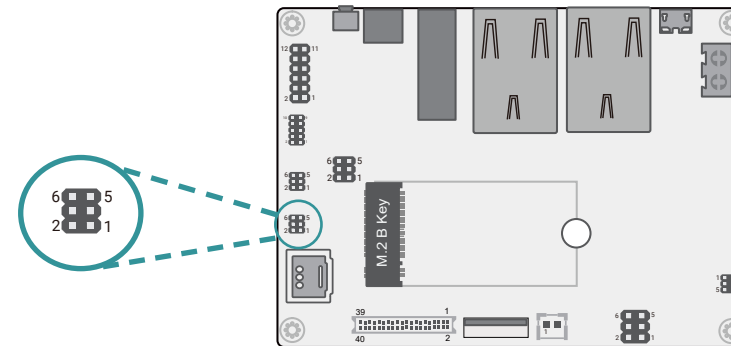
Pin	Assignment	Pin	Assignment
1	ONOFF	2	3V3
3	GND	4	GPIO
5	SYS_nRST	6	SYS_ON#

USB2.0 (UBJ2)
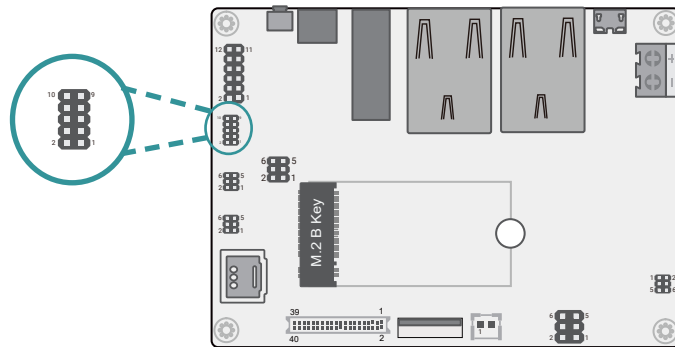
COM5 & COM4 (TSJP1)

Pin	Assignment	Pin	Assignment
1	5V	2	5V
3	D-	4	D-
5	D+	6	D+
7	GND	8	GND
9	NC	10	GND
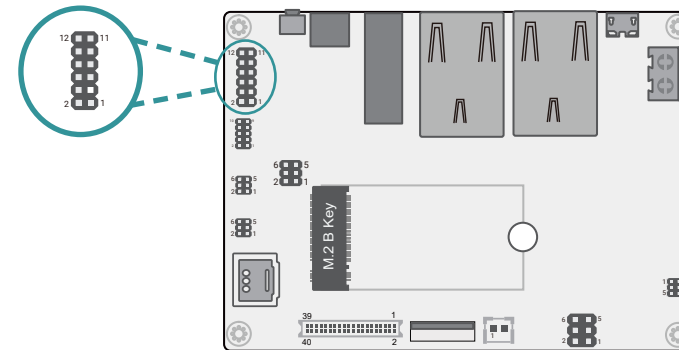
Pin	Assignment	Pin	Assignment
1	RS232_SINN	2	RS232_RTSN
3	RS232_SOUTN	4	RS232_CTSN
5	GND	6	GND
7	COMB_DCDN	8	COMB_SINN
9	COMB_RTSN	10	COMB_SOUTN
11	COMB_CTSN	12	COMB_DTRN

COM4 (RS-232)

Pin	Assignment	Pin	Assignment
1	RS232_SINN	2	RS232_RTSN
3	RS232_SOUTN	4	RS232_CTSN
5	GND	6	GND
7	NC	8	RX
9	RTS	10	TX
11	CTS	12	NC

COM4 (RS-422)

Pin	Assignment	Pin	Assignment
1	RS232_SINN	2	RS232_RTSN
3	RS232_SOUTN	4	RS232_CTSN
5	GND	6	GND
7	TX-	8	TX+
9	---	10	RX+
11	---	12	RX-

COM4 (RS-485)

Pin	Assignment	Pin	Assignment
1	RS232_SINN	2	RS232_RTSN
3	RS232_SOUTN	4	RS232_CTSN
5	GND	6	GND
7	DATA-	8	DATA+
9	---	10	---
11	---	12	---

LVDS (DPJ1)
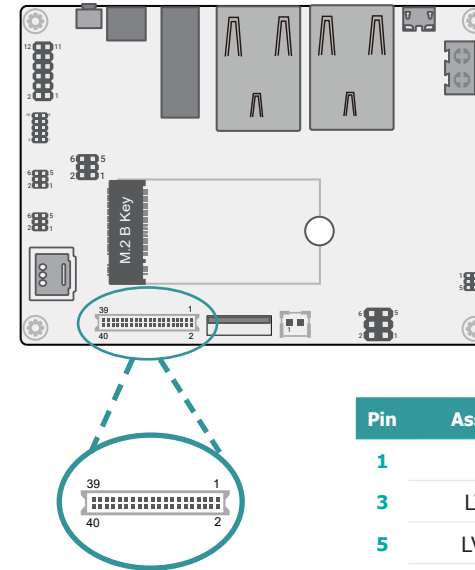
| Pin	Assignment	Pin	Assignment
1	GND	2	3V
3	LVDS_A0-	4	3V
5	LVDS_A0+	6	3V
7	GND	8	GND
9	LVDS_A1-	10	ECSPI6_SS0
11	LVDS_A1+	12	ECSPI6_MOSI
13	GND	14	GND
15	LVDS_A2-	16	ECSPI6_SCLK
17	LVDS_A2+	18	EP_Reset#
19	GND	20	GND
21	LVDS_A3-	22	ECSPI6_MISO
23	LVDS_A3+	24	NC
25	GND	26	GND
27	LVDS_A_CLK-	28	NC
29	LVDS_A_CLK+	30	NC
31	GND	32	GND
33	GND	34	GND
35	3V3	36	5V
37	3V3	38	5V
39	3V3	40	5V

▶ **Expansion Slots**

Installing the M.2 Module
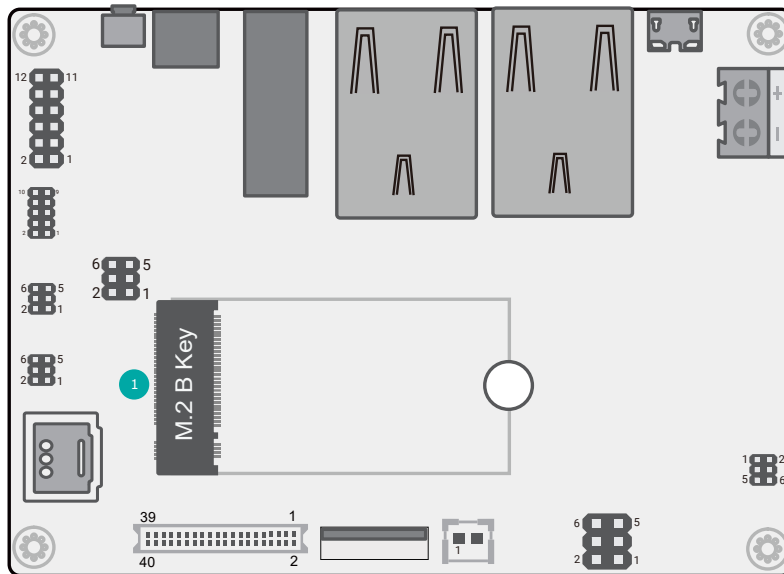
| 1 | M.2 B-Key |

Before installing the M.2 module into the M.2 socket, please make sure that the following safety cautions are well-attended.

1. Make sure the PC and all other peripheral devices connected to it has been powered down.

2. Disconnect all power cords and cables.

3. Locate the M.2 socket on the system board

4. Make sure the notch on card is aligned to the key on the socket.

5. Make sure the standoff screw is removed from the standoff.

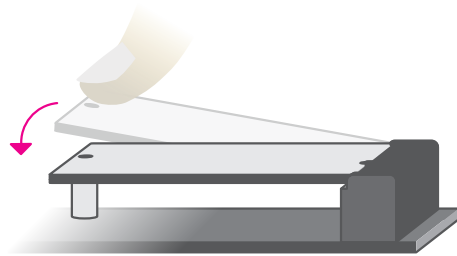≫ **M.2 Module**   ≫ **M.2 Socket**
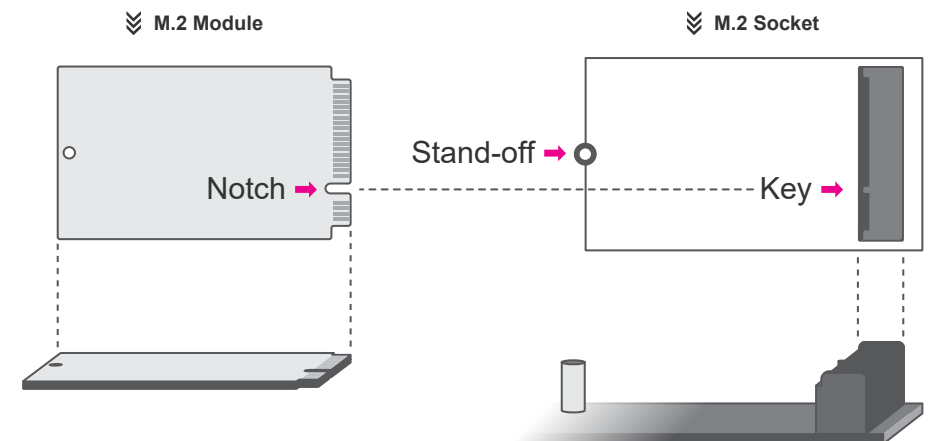
Please follow the steps below to install the card into the socket.
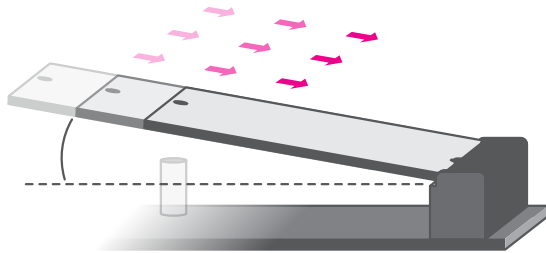
Step 1:
Insert the card into the socket at an angle while making sure the notch and key are perfectly aligned.

Step 2:
Press the end of the card far from the socket down until against the stand-off.
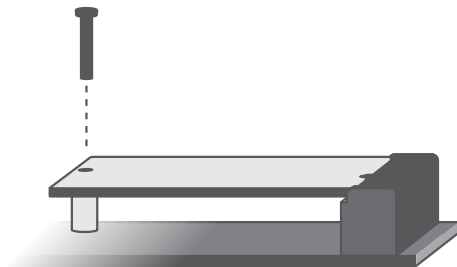
Step 3:
Screw tight the card onto the stand-off with a screw driver and a stand-off screw until the gap between the card and the stand-off closes up. The card should be lying parallel to the board when it's correctly mounted.

Chapter 3 - Software User Guide

▶ Flash Images into eMMC/SD card using UUU tool

1. **Must install necessary Windows drivers first** if user would like to flash images using UUU tool in Windows7.
   • Unzip M93053_YD_x_y_nnn_yymmdd_0000_LPDDR4X_2GB.zip image package
   • See Quick Note in this file (UUU_Flash_Image_Guide_Yocto40_M93053_Vn.m.docx)

2. Download Mode Switch: This switch is used to enter Download Mode.
   Switch for eMMC Boot/SD Card Boot: This switch is located on the device and is used to select the booting method for the device.
   You can set this switch to either "eMMC Boot" or "SD Card Boot" to choose the desired booting method for the device. Please refer to the figure below for reference.
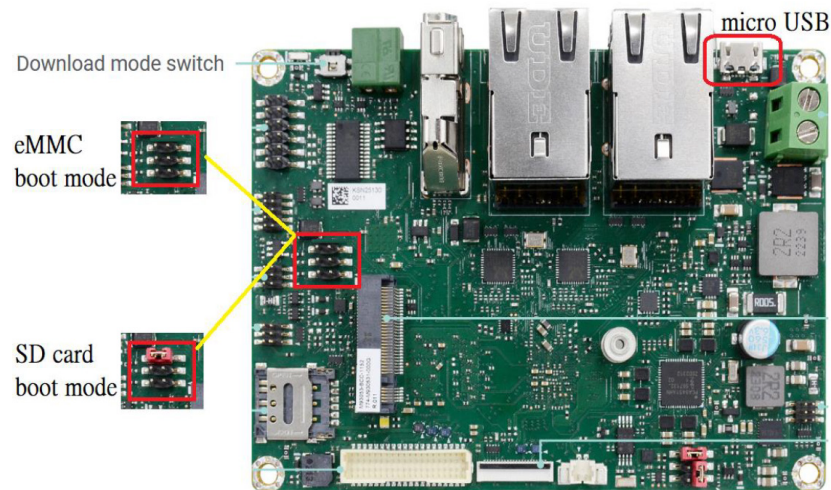
3. Before flashing images into M93053 device via UUU tool, user must configure **BOOTCNFG** to **BOOT Type (eMMC/SD)**, also alleged **Serial Download mode**.
   To enter Serial Download Mode, please follow the steps below:
   • Insert the Micro USB cable into the device.
   • Gently **press the Download Mode switch and make sure not to release it**.
   • Power on or turn on the device.(**The adapter output voltage is 12V**)
   • When you are certain that the device is powered on and in Download Mode, gently release the Download Mode switch.

4. • Open the Command Prompt in Windows7, or open the Terminal in Ubuntu after necessary preparations are done.
   • Enter image release folder.
   • Execute the following command, then wait for process complete.

For Windows:
Flash all images into eMMC
>uuu emmc_all_HDMI.uuu
Flash necessary images except rootfs image into eMMC
>uuu emmc_uboot_kernel_HDMI.uuu

Flashing tool logs in Windows:

Sometimes, UUU flashing process might FAIL, because Windows are runtime installing necessary drivers. User can see the following processes be executed when flashing images into M93053 device.

User must **make sure necessary Windows drivers are installed**, then the processes can complete automatically, or user can't flash images via UUU tool successfully.

• Execute UUU flashing process again after each following driver installation process completes.

For Ubuntu:
$ sudo ./uuu emmc_all_HDMI.uuu
$ sudo ./uuu emmc_uboot_kernel_HDMI.uuu

5. • Turn off the device after flashing process completes

6. **Flash image into SD card**
  • Insert SD card to device.
  • SD card flash commands in Ubuntu
   Flash u-boot/kernel/rootfs images:
    $ sudo ./uuu sd_all_HDMI.uuu
   Flash u-boot/kernel images:
    $ sudo ./uuu sd_uboot_kernel_HDMI.uuu

  • SD card flash commands in windows
   Flash u-boot/kernel/rootfs images:
    > uuu sd_all_HDMI.uuu
   Flash u-boot/kernel images:
    > uuu sd_uboot_kernel_HDMI.uuu

7. Turn on the device

[Quick Note] :
*Win 7 User Guide
a. Back Ground (must do it, or you can't flash image in Windows)
b. Install updated winusb inf file (must do it, or you can't flash image in Windows)

▶ **WinUSB Installation**

winusb.zip

• Unzip
• Run install.bat as **administrator permission**

install.bat
Open
Edit
Print
🛡 **Run as administrator**
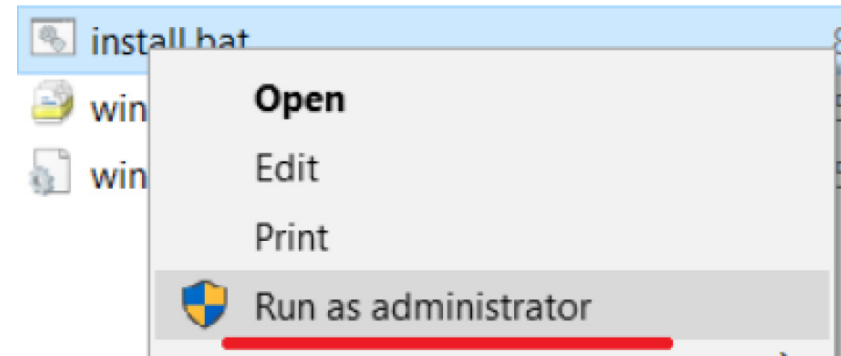
• The screen below is shown when the installation has been successfully completed.

```
C:\Windows\System32\cmd.exe

C:\Windows\system32>echo off
Administrative permission confirmed
===
Microsoft PnP Utility

Processing inf :          winusbcompat.inf
Driver package added successfully.
Published name :          oem8.inf


Total attempted:              1
Number successfully imported: 1

"SUCCESS: WINUSB WCID install"
Hit enter to close_
```
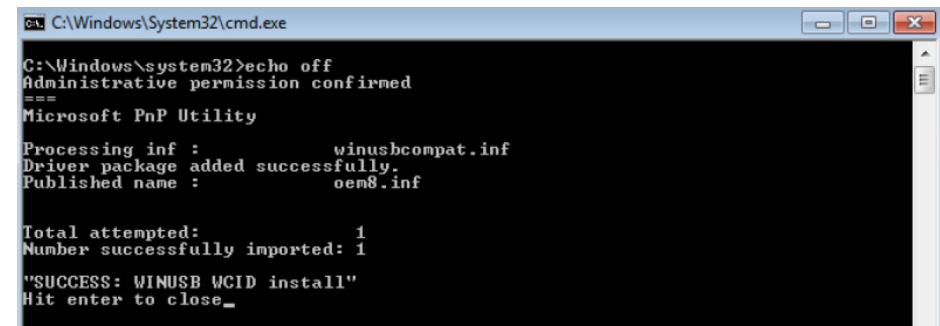
Use zadig to install winusb driver (must do it, or you can't flash image in Windows) If still fail to install winusb driver, you can try the following method.

Run ⚠️ and click Intall WCID Driver.

zadig-2.4.exe
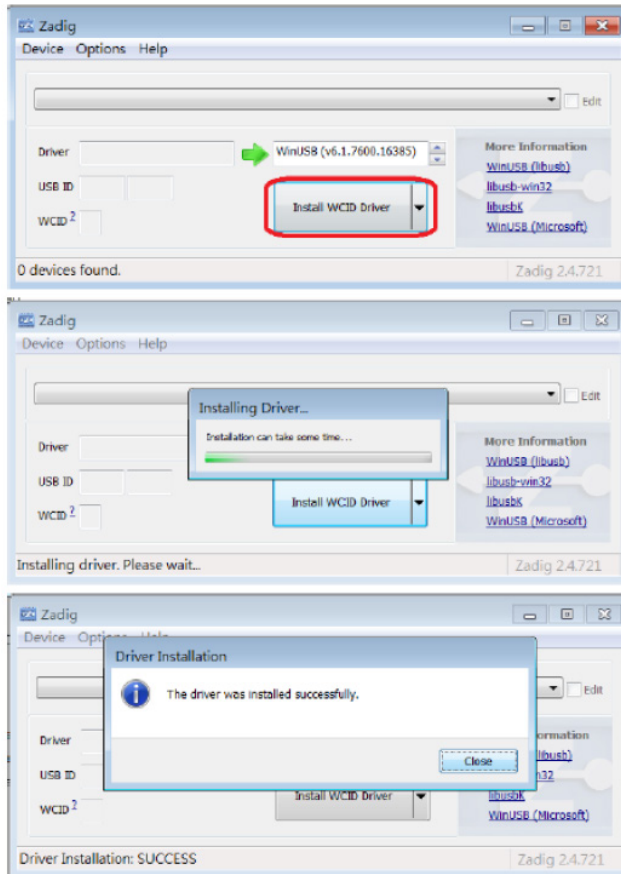
Reboot Windows after drivers are installed, windows will install necessary USB download gadget driver.

▶ Develop Environment

Yocto4.2 kernel 6.1.36-2.1.0 image for M93053 project was built with Ubuntu20.04 docker image and follow i.MX_Yocto_Project_User's_Guide.pdf released by NXP.

▶ General Support

(*) is depended on the NXP support.

Components	Name	Base-Line Feature
General	OS Support	Yocto 4.2 (Default Preloaded on eMMC), Kernel 6.1.36-2.1.0
Misc	Firmware Upgrade (*)	UUU firmware update tool
	Utilities (*)	Hardware diagnostic utilities

▶ Linux AP/API support

(*) is depended on the NXP support.

Component	Description	Detail	Release Schedule
Linux	Yocto 4.2 - Kernel 6.1.36-2.1.0	It's an open-source project that delivers a set of tools that create operating system images for embedded Linux systems. Support wayland weston graphics Demo Image Only (*).	2023, Q4
Linux AP/API	NXP iMX93 Yocto 4.2 BSP Support Wayland Window Support BitBake build tool	All library and utility should support (*). Source code package (support by request).	2023, Q4
	Support I2C, Watchdog, GPIO, LVDS brightness control	Provide support console for i.MX93 platform.	2023, Q4

▶ Yocto Support List

(*) is depended on the NXP support.

Component	Support Status
Yocto Version	4.2
Kernel Version	6.1.36-2.1.0
Window System	Wayland without QT5 build
eMMC	Support eMMC boot by default, eMMC v5.1, Linux EXT4 file system
Ethernet LAN1/2	Support "ping", "ifconfig" console commands verify, static IP/DHCP Dynamic IP, writable MAC address store in eMMC.
USB	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 NXP i.MX uuu update firmware tool.
HDMI Video	Support max display resolution of 1080p60. (ADV7535) Support single display function.
LVDS Panel	Support Panel: AM-1024600DTZQW (I2C Touch: ILI2301S+ILIM2V)
LVDS Backlight	Support PWM backlight control by Linux device node, level value 0~100.
Touch	1. Support Touch: TBD 2. Support single touch function.
Micro SD Card (uSD card slot)	1. Support SD card boot, support SD storage by "mount" console command, FAT filesystem. 2. Support SD boot (select by boot switch). 3. Not support SDIO module.
M.2 B key	1. Support "lspci" console command for check PCIe card status. LTE module : Quectel EM06.
COM Port (RS232/RS485/RS422)	Support Loopback test, (need DFI Linux user space utility).
GPIO	Support read input high/low status, set output voltage high/low status, control by Linux device node, 8 pins.
I2C	Support "i2cdetect" console command for detect I2C device.

Component	Support Status
SPI	Support read/write data by NXP utility spidev_test.(Winbond 25Q128JV).(chip TBD)
PWM-DIO	Support control by Linux device node.
Debug serial port	Support read Linux kernel debug message by serial port, use PC serial terminal tool (ex. PuTTY), BR 115200.
Play Video	Support play MPEG4 (play by NXP gstreamer tool).
Watch Dog	Support NXP utility "wdt_driver_test.out"(*) to test Watch Dog reboot function.
CAN Bus	CAN Bus Support "cansend", "candump" console commands for test send/read data.
RTC	Support Linux "date -s"and "hwclock -w" console commands to set system time.
MIPI Camera	RPI-CAM-MIPI Camera adapter (AR0144 Sensor)
Power saving feature (suspend/resume)*	Not supported.

M93053 Yotco4.2 BSP base on https://github.com/nxp-imx/imx-manifest, imx_6.1.36_2.1.0 branch, imx-image-multimedia build (Builds Wayland weston graphics without Qt5 image). Refer from imx-yocto-L6.1.36_2.1.0 i.MX_Yocto_Project_User's_Guide.pdf.

▶ U-BOOT Function Available List

a. Booting: eMMC/SD Card
b. eMMC& SDCARD Function
c. UART Console Debug
d. Save U-BOOT environment in eMMC or SD Card

Appendix A- Mating Connectors

▶ The Mating Connectors List

Please refer to the following list of the mating connectors.

Function	Connector	Connector information	Rate output
COM5 & COM4	TSJP1	PINREX, PIN PLUG, 2*6, 2.0mm, H=6.7mm, 180D, SMT, 222-97-06GBE1(R)	12v/1A
USB2.0	UBJ2	V-STAR, PIN PLUG, 2*5, 1.27mm, H=5mm, 180D, SMD, SHY-JCL180810P	5V/3A
I2C Touch	TPJP1	V-STAR, PIN PLUG, 2*3, 1.27mm, H=5mm, 180D, SMD, SHY-JCL180806P	5V/3A
Front Panel	FPJP1	V-STAR, PIN PLUG, 2*3, 1.27mm, H=5mm, 180D, SMD, SHY-JCL180806P	5V/3A
SPI	SPJP1	V-STAR, PIN PLUG, 2*3, 1.27mm, H=5mm, 180D, SMD, SHY-JCL180806P	3.3V/3A
LVDS	DPJ1	V-STAR, BOX HEADER, 2*20, 1.00mm, 180D, SMD, W100V40TP2	12V/1A
CAN Bus	CBCN1	YIMTEX, BOX HEADER, 1*4P, F, 90D, 1.25mm, SMT, 501MW1*04MTR-2R	5V/1A
Digital I/O	TSJ1	TOKUTSU, BOX HEADER, 1*10P/1.25mm, F, NATURAL, 90D, SMT, 1W1257WOR0-10CNA	5V/1A
LCD BackLight Power	BLJ1	JST, BOX HEADER, 1*8P/1.0mm, F, NATURAL, 90D, SMT, SM08B-SRSS-TB(LF)(SN)	12V/0.7A
MIPI-CSI	CMCN1	ACES, FPC CONN, 1*22P/0.5mm, ZIF, BACK-FLIP, 1.98H, F, 3u", WHITE, 90D, SMT, 50696-0220M-002	N/A