



Thundercomm TurboX C2290 CM2290 Development Kit Linux Android

# Software User Manual

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DN: tc-jla-2310

## Revision History

| Revision | Date          | Author      | Description      |
|----------|---------------|-------------|------------------|
| 1.0      | June 15, 2023 | Tongtong Li | Initial release. |

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## About This Document

- Illustrations in this documentation only apply to **Common DK hardware V03** which consists of the following boards:
  - **Main Board V03**
  - **Audio Board V01**
  - **Sensor Board V01**
- Depending on the model, some optional accessories, features, and software programs might not be available on your device.
- Depending on the version of operating systems and programs, some user interface instructions might not be applicable to your device.
- Documentation content is subject to change without notice. Thundercomm makes constant improvements on the documentation of the products, including this guidebook.
- Function declarations, function names, type declarations, attributes, and code samples appear in a different format, for example, `cp armcc armcpp`.
- Code variables appear in angle brackets, for example, `<number>`.
- Button, tool, and key names appear in bold font, for example, click **Save** or press **Enter**.
- Commands to be entered appear in a different font; on the host computer use \$ as shell prompt, while on the target device use # as shell prompt, for example,

```
$ adb devices
# logcat
```
- Part of the code that does not contain instructions appear in a different format, for example,

```
SUBSYSTEM=="usb", ATTR{idVendor}=="18d1", MODE="0777", GROUP="adm"
```
- Folders and files are formatted in italic, for example, *turbox\_flash\_flat.sh*.

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# Chapter 1. Product Overview

The TurboX C2290/CM2290 development kit is a cost-effective solution to evaluate the performance and build the prototype of the smart cameras and intelligent IoT devices quickly. The development kit features rich interfaces, including Type-C USB, HDMI out, Ethernet, and camera modules. The development kit supports Android R and Android T operating system versions, combining powerful artificial intelligence and machine learning to address increasing demand for smart cities, commercial and enterprise, homes, and vehicles applications.

☞ “TurboX” referred to herein is the English text of our registered trademark: **TURBOX**.

## 1.1. Introduction

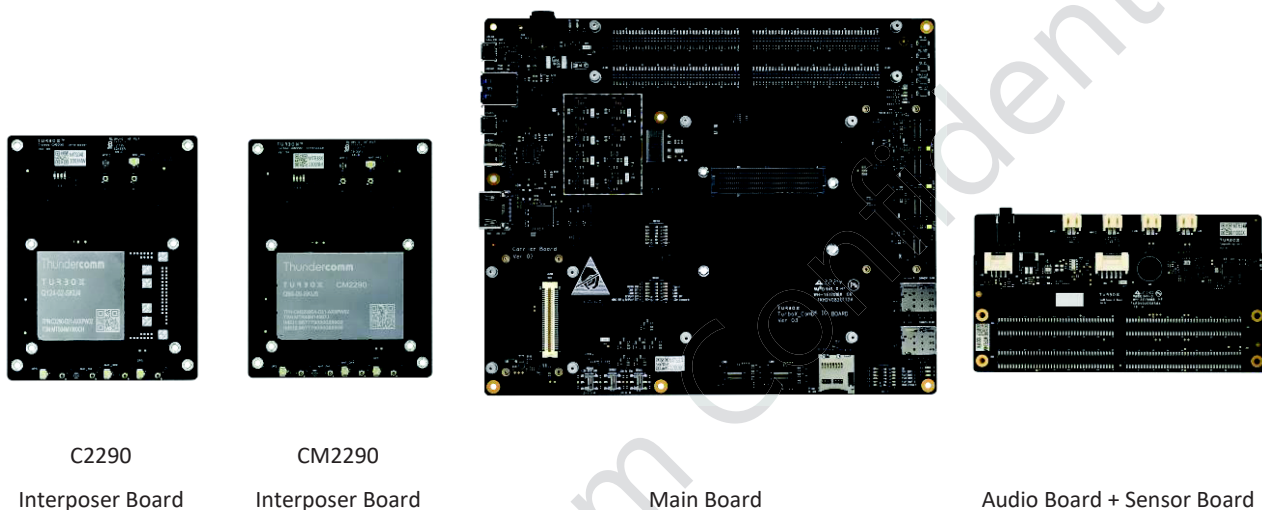


Figure 1-1. Board Identification

## 1.2. Board layout

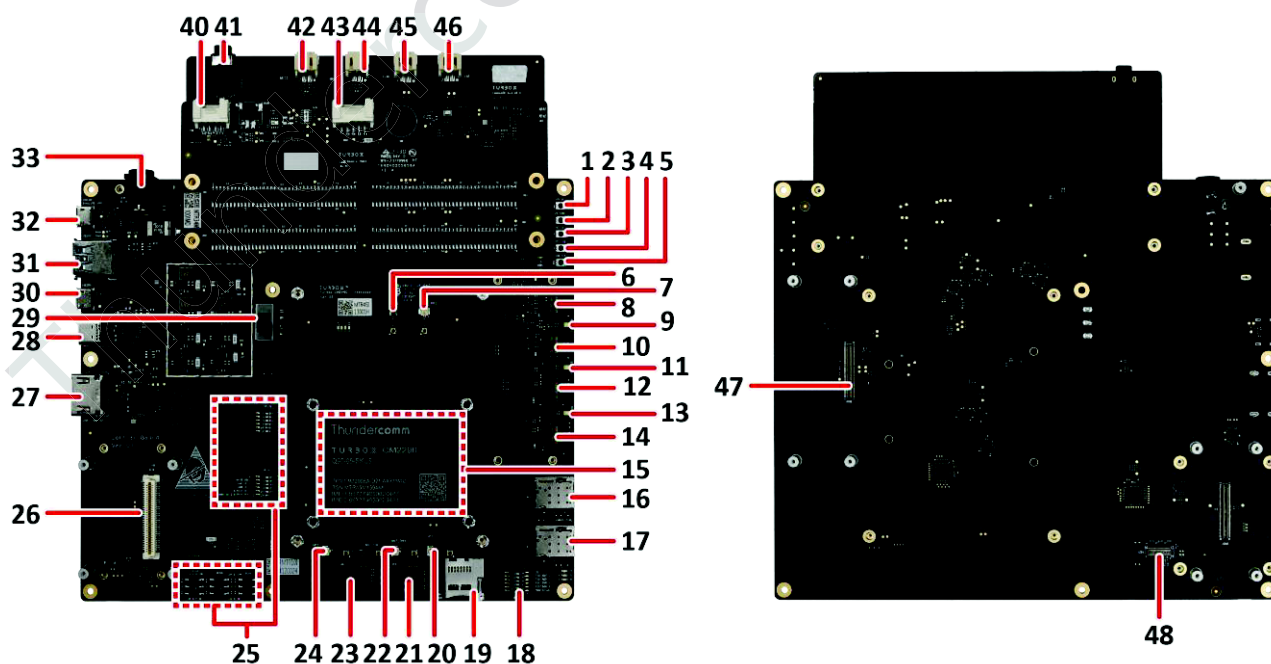


Figure 1-2. Board Layout

**Table 1-1. Board layout description**

|                                                                 |                                                                 |
|-----------------------------------------------------------------|-----------------------------------------------------------------|
| 1. Power on button                                              | 22. Discontinuous reception antenna connector                   |
| 2. Volume down button                                           | 23. NA                                                          |
| 3. Volume up button                                             | 24. GNSS signal-receiving antenna connector<br>(for C2290 only) |
| 4. Force USB button                                             | 25. DIP switches                                                |
| 5. Home button                                                  | 26. NA                                                          |
| 6. Wi-Fi antenna connector                                      | 27. HDMI out port                                               |
| 7. Primary antenna connector                                    | 28. Type-C USB port                                             |
| 8. Camera module connector 1                                    | 29. Power selective switch                                      |
| 9. Flash LED 1                                                  | 30. Micro USB port                                              |
| 10. Camera module connector 0                                   | 31. NA                                                          |
| 11. Flash LED 2 <sup>1)</sup>                                   | 32. UART debug port                                             |
| 12. NA                                                          | 33. 12V DC in jack                                              |
| 13. Flash LED 3 <sup>2)</sup>                                   | 40. Fan connector                                               |
| 14. NA                                                          | 41. Headset connector                                           |
| 15. SOM plate                                                   | 42. Analog microphone connector 3                               |
| 16. SIM card slot 1                                             | 43. Battery connector                                           |
| 17. SIM card slot 2                                             | 44. Analog microphone connector 1                               |
| 18. Boot config switch                                          | 45. Line out speaker connector                                  |
| 19. SD card slot                                                | 46. Ear speaker connector                                       |
| 20. GPS signal-receiving antenna connector<br>(for CM2290 only) | 47. NA                                                          |
| 21. NA                                                          | 48. Display panel connector (for LCM)                           |

<sup>1) 2)</sup> Unavailable on DK V03.

## 1.3. Features and specifications

**Table 1-2. Features and specifications**

| Category              | CM2290                                   | C2290                                    |
|-----------------------|------------------------------------------|------------------------------------------|
| Region/Operator       | EMEA/NA                                  | Global                                   |
| Platform              | Snapdragon™ QCM2290                      | Snapdragon™ QCS2290                      |
|                       | Quad-core Arm Cortex-A53, 64-bit, 2.0GHz | Quad-core Arm Cortex-A53, 64-bit, 2.0GHz |
|                       | Adreno™ 702 GPU                          | Adreno™ 702 GPU                          |
|                       | Hexagon™ QDSP6 v66                       | Hexagon™ QDSP6 v66                       |
| Memory                | LPDDR4x 3GB/2GB + eMMC 16GB              | LPDDR4x 2GB + eMMC 16GB                  |
| OS                    | Android 11, Android 13, Linux            | Android 11, Android 13                   |
| Dimensions            | 51mm x 35mm x 2.9mm                      | 34mm x 35mm x 2.9mm                      |
| Operation Temperature | -25°C ~ 75°C                             | -25°C ~ 75°C                             |

| Category           | CM2290                                                                                                                                                                                                                                                                                                                                                         | C2290                                                                             |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| RF Bands           | <ul style="list-style-type: none"> <li>• EMEA: <ul style="list-style-type: none"> <li>▫ LTE: B1/B2/B3/B5/B7/B8/B20/B28(A+B)/B38/B39/B40/B41</li> <li>▫ WCDMA: B1/B2/B5/B8</li> <li>▫ GSM: 850/900/1800/1900</li> </ul> </li> <li>• North America: <ul style="list-style-type: none"> <li>▫ LTE: B2/B4/B5/B7/B12/B13/B17/B25/B41/B66/B71</li> </ul> </li> </ul> | NA                                                                                |
| WLAN               | Wi-Fi 802.11a/b/g/n/ac                                                                                                                                                                                                                                                                                                                                         | Wi-Fi 802.11a/b/g/n/ac                                                            |
| Bluetooth          | Bluetooth 5.0                                                                                                                                                                                                                                                                                                                                                  | Bluetooth 5.0                                                                     |
| GNSS               | GPS, Glonass, BeiDou, Galileo, QZSS, and SBAS                                                                                                                                                                                                                                                                                                                  | Reserve GNSS_IQ to extend support Qualcomm WGR7640                                |
| Display Interfaces | 1x MIPI-DSI 4-lane, Supports HD+(1680 × 720) @60FPS                                                                                                                                                                                                                                                                                                            | 1x MIPI-DSI 4-lane, Supports HD+(1680 × 720) @60FPS                               |
| Camera Interface   | 2x MIPI-CSI, 4 + 4 or 4 +2+1, D-PHY 1.2 at 2.5 Gbps per lane                                                                                                                                                                                                                                                                                                   | 2x MIPI-CSI, 4 + 4 or 4 +2+1, D-PHY 1.2 at 2.5 Gbps per lane;                     |
|                    | 2x ISP (13 MP + 13 MP or 25 MP) @30FPS ZSL                                                                                                                                                                                                                                                                                                                     | 2x ISP (13 MP + 13 MP or 25 MP) @30FPS ZSL                                        |
| Video              | 1080p@30FPS (H.265/H.264)                                                                                                                                                                                                                                                                                                                                      | 1080p@30FPS (H.265/H.264)                                                         |
|                    | 1080p@30FPS (H.265/H.264/VP9)                                                                                                                                                                                                                                                                                                                                  | 1080p@30FPS (H.265/H.264/VP9)                                                     |
| Other Interfaces   | 1 x SoundWire, 1 x USB 3.1 Type C; 8 x QUP; 1 x SD Card; 2 x UIM; GPIOs, 1 x I2S, 2 x DMIC                                                                                                                                                                                                                                                                     | 1 x SoundWire, 1 x USB 3.1 Type C; 8 x QUP; 1 x SD Card; 2 x UIM; GPIOs, 4 x DMIC |

Refer to [Figure 1-3](#) and [Table 1-3](#) for the status and function description of the DIP switches.

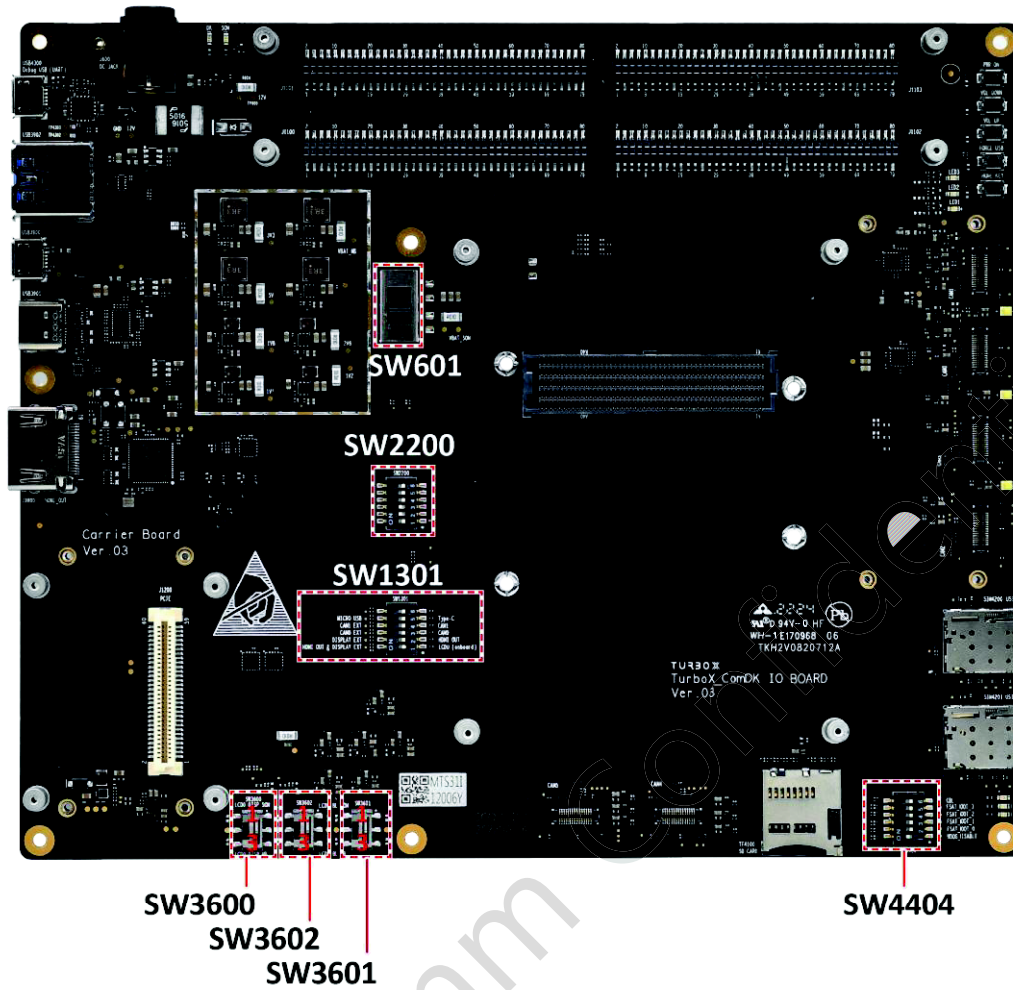


Figure 1-3. DIP Switches

**Table 1-3. Status and function description of DIP switch**

| SW601  |                      |                                                                                                                                                    |         |
|--------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Pin#   | Name                 | Function                                                                                                                                           | Default |
| 1      | VBAT_DC_SOM          | Select DC-IN as SOM power source                                                                                                                   | ON      |
| 3      | VBAT_PACK_SOM        | Select battery as SOM power source                                                                                                                 | OFF     |
| SW1301 |                      |                                                                                                                                                    |         |
| Pin #  | Name                 | Function                                                                                                                                           | Default |
| 1      | SW_DSI0_HDMI         | Control DSI0 switch for LCD0 on board or HDMI OUT<br>• OFF: Use LCD0 on Main Board<br>• ON: Use HDMI out as display or use Display Expansion Board | OFF     |
| 2      | SW_EXT_DISPLAY       | Control DSI switch for HDMI OUT or Display Expansion Board<br>• OFF: Use HDMI out as display<br>• ON: Use Display Expansion Board                  | OFF     |
| 3      | SW_CSI0_HDMI         | Control CSI0 switch for CAM0 or Camera Expansion Board<br>• OFF: Use CAM0 on Main Board<br>• ON: Use Camera Expansion Board                        | OFF     |
| 4      | SW_CSIH1_DMI         | Control CSI1 switch for CAM1 or Camera Expansion Board<br>• OFF: Use CAM1 on Main Board<br>• ON: use Camera Expansion Board                        | OFF     |
| 5      | SW_HS_TYPEC_MICROUSB | Control USB0 HS switch for Type C or Micro USB<br>• OFF: Use Type-C port<br>• ON: Use Micro USB port                                               | OFF     |
| 6      | -                    | -                                                                                                                                                  | -       |
| SW2200 |                      |                                                                                                                                                    |         |
| Pin #  | Name                 | Function                                                                                                                                           | Default |
| 1      | PM_PWM_A_LS          | Connect PM_PWM_A to low-speed interface as GPIO.<br>• OFF: -<br>• ON: connect this signal to low-speed connector                                   | OFF     |
| 2      | LCD0_BL_PWM_T        | Connect PM_PWM_A for dimming backlight.<br>• OFF: -<br>• ON: backlight dimming                                                                     | ON      |
| 3      | LCD0_BL_PWM_CON      | Connect PM_PWM_A to LCD0 for dimming backlight.<br>• OFF: -<br>• ON: LCD0 backlight dimming                                                        | ON      |
| 4      | LCD0_BL_PWM_EXT      | Connect PM_PWM_A to Display Expansion Board<br>• OFF: -<br>• ON: used for Display Expansion Board                                                  | OFF     |

|   |                |                                                                                                                    |     |
|---|----------------|--------------------------------------------------------------------------------------------------------------------|-----|
| 5 | CON_GPIO_A9_LS | Connect CON_GPIO_A9 to low-speed interface as GPIO<br>• OFF: -<br>• ON: connect this signal to low-speed connector | OFF |
| 6 | LCD0_TE_T      | Connect CON_GPIO_A10 to LCD1 for TE<br>• OFF: -<br>• ON: LCD1 use TE signal                                        | OFF |

**SW3600**

| Pin # | Name             | Function                          | Default |
|-------|------------------|-----------------------------------|---------|
| 1     | VDISP0_P/M_OUT   | Select SOM supply for LCD VSP/VSN | OFF     |
| 3     | VDISP0_P/M_OUT_B | Select DK supply for LCD VSP/VSN  | ON      |

**SW3601/SW3602**

| Pin # | Name                              | Function                            | Default |
|-------|-----------------------------------|-------------------------------------|---------|
| 1     | VREG_WLED<br>WLED_SINK1/2         | Select SOM supply for LCD Backlight | OFF     |
| 3     | LCD0_BL_LED_A<br>LCD0_BL_LED_K1/2 | Select DK supply for LCD Backlight  | ON      |

**SW4404**

| Pin # | Name             | Function                     | Default |
|-------|------------------|------------------------------|---------|
| 1     | SDM_WDOG_DISABLE | boot_config[0], WDOG_DISABLE | OFF     |
| 2     | SDM_FAST_BOOT_0  | boot_config[1], FAST_BOOT[0] | OFF     |
| 3     | SDM_FAST_BOOT_1  | boot_config[2], FAST_BOOT[1] | OFF     |
| 4     | SDM_FAST_BOOT_2  | boot_config[3], FAST_BOOT[2] | OFF     |
| 5     | SDM_FAST_BOOT_3  | boot_config[4]               | OFF     |
| 6     | CBL_PWR_N        | CBL                          | OFF     |

**Table 1-4. TurboX C2290/CM2290 configuration**

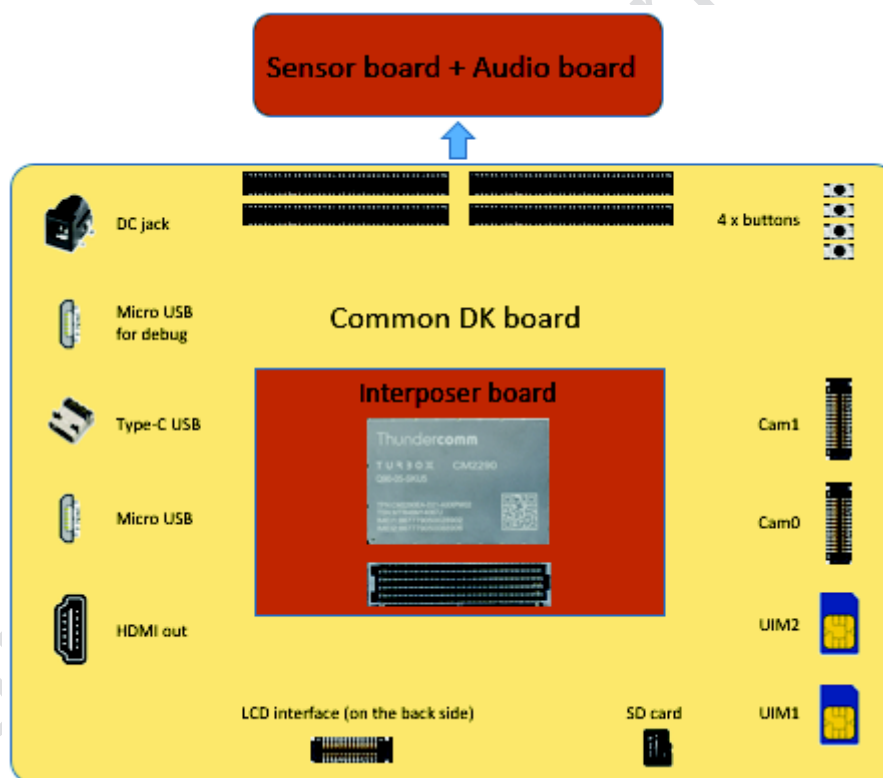
| SOC     | SKUx  |        | USB Support* | OS    | Model            |
|---------|-------|--------|--------------|-------|------------------|
| QCM2290 | SKU1  | 3+16GB | Type C       | LA/LE | TurboX CM2290-EA |
|         | SKU5  | 2+16GB | Micro USB    | LA/LE | TurboX CM2290-EA |
|         | SKU14 | 2+16GB | Type C       | LA/LE | Turbox CM2290-NA |
| QCS2290 | SKU2  | 2+16GB | Type C       | LA    | TurboX C2290     |
|         | SKU4  | 2+16GB | Micro USB    | LA    | TurboX C2290     |

**NOTE:**

\* indicates that different SKU series support different USB types (as listed above).

The SKU series control the use of USB through (SW1301 toggle 5).

- SKU5 and SKU4 only support micro USB mode (SW1301 toggle 5 to ON).
- SKU1, SKU2 and SKU14 only support Type C mode (SW1301 toggle 5 to OFF).

**1.4. Product diagram****Figure 1-4. Block Diagram**

**NOTE:** Camera module and TFT-LCD are accessories to the development kit.

## Chapter 2. Flash Images

Refer to *TurboX C2290 CM2290 DK\_LA Software Release Notes*.

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## Chapter 3. Function Verification Test

This chapter introduces the detailed testing steps on various functions.

### 3.1. UART debug port

#### 3.1.1. Connect to ADB

As different SKU series support different USB ports (refer to [Table 1-4](#) for details), Micro USB port is taken for example as follows to introduce ADB connection procedure.

Step 1. Connect the device to your PC via the **Micro USB port** (No. 30 in [Figure 1-2](#)).

Step 2. Enter the following command and wait for ADB port to appear.

```
$ adb wait-for-device && lsusb
.....
Bus 001 Device 102: ID 05c6:901d Qualcomm, Inc.
.....
```

Step 3. After the ADB port appears, enter the following commands to use the ADB.

```
$ adb root
restarting adbd as root
$ adb shell
/ # ls
acct bin cache d data_mirror default.prop etc init.envIRON.rc lost+found mnt oem
proc res storage system vendor apex bugreports config data debug_ramdisk dev init
linkerconfig metadata odm postinstall product sdcard sys system_ext
```

#### 3.1.2. Connect over UART

You cannot use ADB when the system crashes and cannot boot up normally. Instead, use the UART debug port to capture log information for analysis.

Step 1. Connect the device to your PC via the **UART debug port** (No. 32 in [Figure 1-2](#)).

Step 2. Use a UART tool you prefer, such as **Minicom**.

A new serial port will be added to your PC after the device been connected. Select the new serial port, and configure it to 115200 8N1. Refer to [Figure 3-1](#) for the configuration of **Minicom 2.7**.

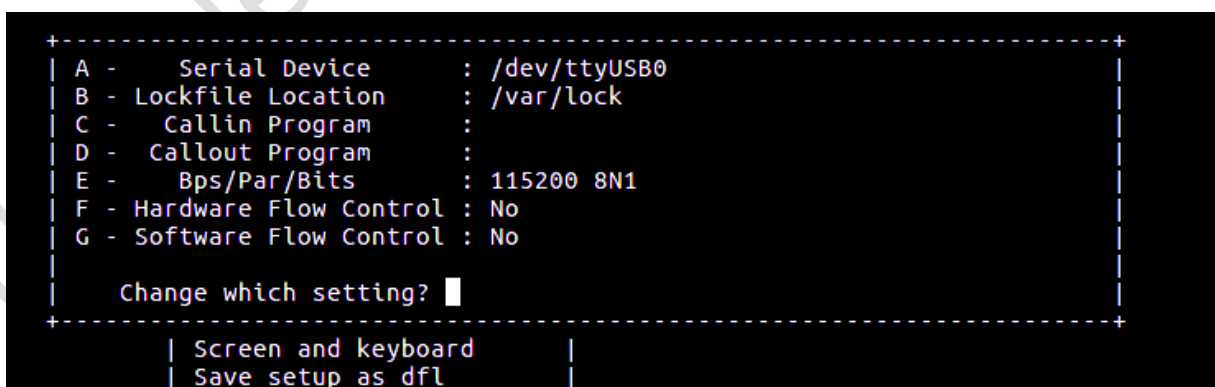


Figure 3-1. Minicom 2.7 Configuration

➡ **NOTE:** UART debug cannot be used in perf/user version.

## 3.2. SD card slot

No.19 in [Figure 1-2](#)

Step 1.The SD card slot is hot-swappable. When inserted to the board, SD card shall automatically mount to a temporary file in `/mnt/media_rw/<SD Card UUID>`, for example: `/mnt/media_rw/1914-2E34`. Run the following command to check whether the SD card has already mounted to `/mnt/media_rw/<SD Card UUID>`.

```
# ls /mnt/media_rw/
```

Step 2.Run the following commands to check the writing speed of the SD card.

```
$ adb shell
# dd if=/dev/zero of=/mnt/media_rw/<SD card UUID>/write_test bs=1024 count=1048576
1048576+0 records in
1048576+0 records out
1073741824 bytes (1.0 G) copied, 79.509317 s, 13 M/s
```

Step 3.Run the following commands to check the reading speed of the SD card.

```
$ adb shell
# dd if=/mnt/media_rw/<SD card UUID>/write_test of=/dev/null bs=1024
1048576+0 records in
1048576+0 records out
1073741824 bytes (1.0 G) copied, 13.266382 s, 77 M/s
```

## 3.3. Display panel connector (for LCM)

Step 1.Power off the device.

Step 2.Connect the LCD panel to the board via the **Display panel connector** (No.48 in [Figure 1-2](#)).

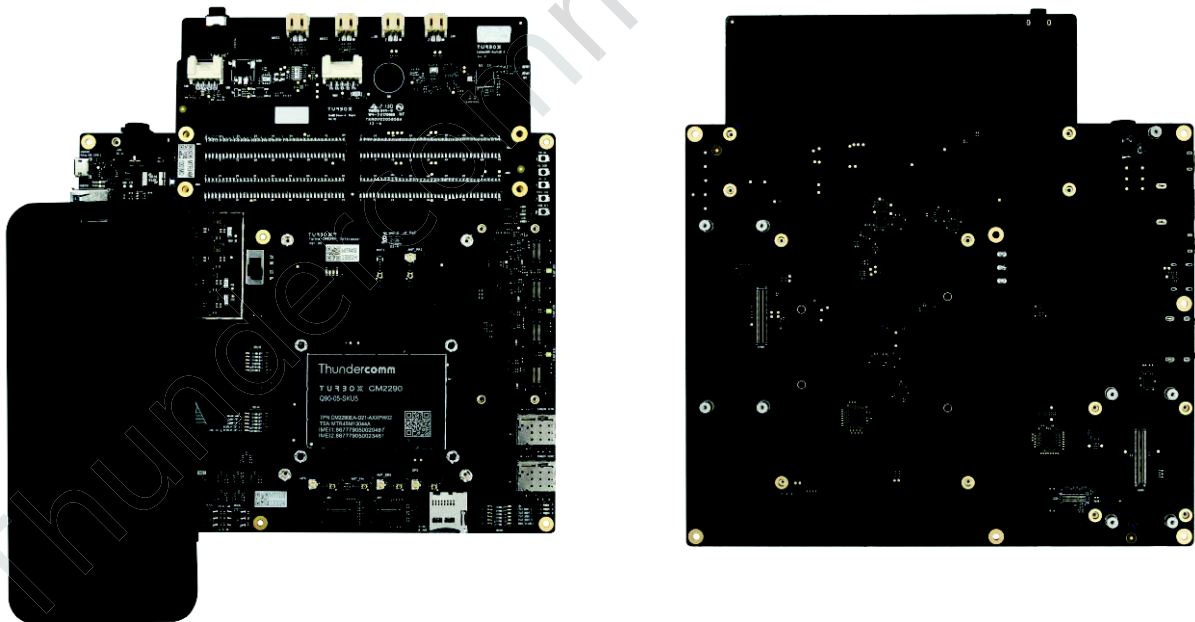


Figure 3-2.Connecting ili9881p LCD Panel

Step 3.Connect the device to your computer via the **UART debug port** (No.32 in [Figure 1-2](#)).

Step 4. Set the Dip switches. Refer to [Table 1-3](#) and [Figure 3-3](#).

- SW2200: Toggle 2 and 3 to ON
- SW1301: Toggle 1 to OFF

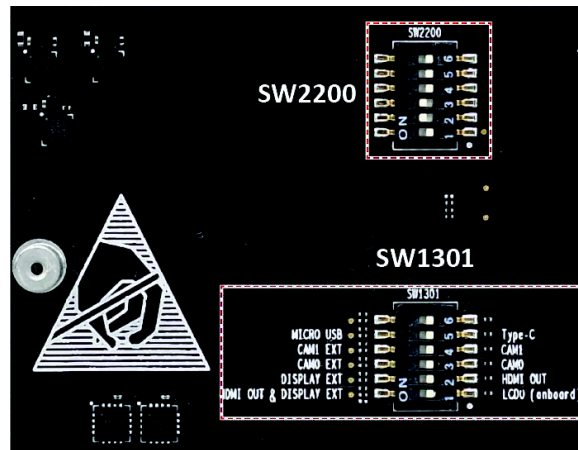


Figure 3-3. Set the Dip Switches

Step 5. Press the **Power on button** (No.1 in [Figure 1-2](#)) to boot up the system (in normal mode).

```
Format: Log Type - Time(microsec) - Message - Optional Info
Log Type: B - Since Boot(Power On Reset), D - Delta, S - Statistic
S - QC_IMAGE_VERSION_STRING=BOOT.XF.4.1-00208-KAMORTALAZ-1
S - IMAGE_VARIANT_STRING=AgattiPkgLAA
S - OEM_IMAGE_VERSION_STRING=a59967df5044
S - Boot Interface: eMMC
S - Secure Boot: Off
...
S - PBL Patch Ver: 1
S - PBL freq: 600 MHZ
...
S - 204526 - PBL, End
B - 219915 - SBL1, Start (MPM timestamp = 224785)
...
B - 2039931 - SBL1, End
D - 1823428 - SBL1, Delta
S - Flash Throughput, 60000 KB/s (6013827 Bytes, 98976 us)
S - DDR Frequency, 1555 MHz

UEFI Start [ 2249]
- 0x05FC01000 [ 2255] Sec.efi
...
Booting from slot (_a)
Booting Into Mission Mode
Load Image vbmeta_a total time: 2 ms
Load Image vbmeta_system_a total time: 1 ms
Load Image boot_a total time: 1004 ms
Load Image dtbo_a total time: 192 ms
VB2: Authenticate complete! boot state is: orange
...
Shutting Down UEFI Boot Services: 15476 ms
Start EBS [15476]
BDS: LogFs sync skipped, Unsupported
App Log Flush : 17 ms
Exit EBS [15510] UEFI End
[ 0.000000] Booting Linux on physical CPU 0x0000000000 [0x51af8014]
[ 0.000000] Linux version 4.19.95+ (scm@4c4ef74c731a) (clang version 8.0.16 for
Android NDK) #1 SMP PREEMPT Tue Mar 16 03:14:31 CST 2021
[ 0.000000] memblock_reserve: 0x59775 setup_arch+0x8c/0x5b4
[ 0.000000] Machine model: Qualcomm Technologies, Inc. Scuba IOT IDP
```

```

.....
[ 0.000000] Kernel command line: rcupdate.rcu_expedited=1 rcu_nocbs=0-7
console=ttyMSM0,115200n8 earlycon=msm_geni_serial,0x4a90000
androidboot.hardware=qcom androidboot.console=ttyMSM0 androidboot.memcg=1
lpm_levels.sleep_disabled=1 video=vfb:640x400,bpp=32,memsize=3072000
msm_rtb.filter=0x237 service_locator.enable=1 swiotlb=2048 loop.max_part=7
buildvariant=userdebug androidboot.verifiedbootstate=orange androidboot.keymaster=1
androidboot.vbmeta.device=PARTUUID=a90d0749-c521-7a28-99d9-1f0ec8aaf7da
androidboot.vbmeta.avb_version=1.0 androidboot.vbmeta.device_state=unlocked
androidboot.vbmeta.hash_alg=sha256 androidboot.vbmeta.size=5952
androidboot.vbmeta.digest=492acaf14eala5b693256fdc0d1bace4b4499e3edc2923233e5ab67e7
9824300 androidboot.vbmeta.invalidate_on_error=yes androidboot.veritymode=enforcing
androidboot.bootdevice=4744000.sdhci androidboot.boot_devices=soc/4744000.sdhci
androidboot.serialno=59c88399 androidboot.baseband=msm
msm_drm.dsi_display0=qcom,mdss_dsi_ili9881p_720p_video
.....

```

Step 6. The **Android Home Screen** will be displayed on LCD panel, which means the touch panel can be operated normally.

## 3.4. Type-C USB port

No.28 in [Figure 1-2](#)

### 3.4.1. Connect USB OTG cable

➤ **NOTE:** As different SKU series support different USB ports (refer to [Table 1-4](#) for details), Type-C port is taken for example as follows to introduce USB OTG.

The board shall detect an external hub once connected by a Type-C USB OTG cable. Input `dmesg | grep usb` for detailed information.

➤ **NOTE:** When connecting an OTG cable, you need to toggle pin 5 of SW1301 to ON.

Refer to [Table 1-4](#) for details.

```

# dmesg | grep usb
[ 223.202852] msm-usb-ssphy-qmp 1615000.ssphy: USB QMP PHY: Update TYPEC CTRL(3)
[ 223.217302] msm-dwc3 4e00000.ssusb: DWC3 exited from low power mode
[ 223.952570] ipa_usb_notify_cb: Set net_ready_trigger
[ 223.975818] ipa_usb_notify_cb: Set net_ready_trigger

```

### 3.4.2. Connect USB storage device

Connect a USB storage device with a Type-C USB OTG cable. Input `dmesg` for detailed information of the USB storage device.

```

# dmesg
[219.561083] xhci-hcd xhci-hcd.0.auto: xHCI Host Controller
[219.561181] xhci-hcd xhci-hcd.0.auto: new USB bus registered, assigned bus number 1
[219.564232] xhci-hcd xhci-hcd.0.auto: hcc params 0x0230fe65 hci version 0x110 quirks
0x000000000000010810
[219.564324] xhci-hcd xhci-hcd.0.auto: irq 192, io mem 0x04e00000
[219.574599] usb usb1: New USB device found, idVendor=1d6b, idProduct=0002, bcdDevice=
4.19
....
[219.910331] usb 1-1: new high-speed USB device number 2 using xhci-hcd
[220.168335] usb 1-1: New USB device found, idVendor=058f, idProduct=6387, bcdDevice=
1.03
[220.168357] usb 1-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[220.168372] usb 1-1: Product: aigo MiniKing USB Device
[220.168388] usb 1-1: Manufacturer: aigo
[220.168404] usb 1-1: SerialNumber: 5FD05D98
[220.176001] usb-storage 1-1:1.0: USB Mass Storage device detected

```

### 3.4.3. Connect network cable

Step 1. Plug in a USB Ethernet cable to the device and enter the following commands to test the network connection.

```
# ifconfig eth0
eth0      Link encap:Ethernet  HWaddr 00:0E:C6:71:25:57
          inet addr:192.168.55.50  Bcast:192.168.55.255  Mask:255.255.255.0
          inet6 addr: fe80::20e:c6ff:fe71:2557/64  Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:263 errors:0 dropped:18 overruns:0 frame:0
          TX packets:17 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:17070 (16.6 KiB)  TX bytes:1794 (1.7 KiB)
```

Step 2. Perform a ping test.

```
# ping www.baidu.com
PING www.baidu.com (112.80.248.75): 56 data bytes
64 bytes from 112.80.248.75: seq=0 ttl=53 time=35.512 ms
64 bytes from 112.80.248.75: seq=1 ttl=53 time=219.867 ms
64 bytes from 112.80.248.75: seq=2 ttl=53 time=63.261 ms
64 bytes from 112.80.248.75: seq=3 ttl=53 time=163.691 ms
64 bytes from 112.80.248.75: seq=4 ttl=53 time=45.115 ms
```

### 3.5. LED control

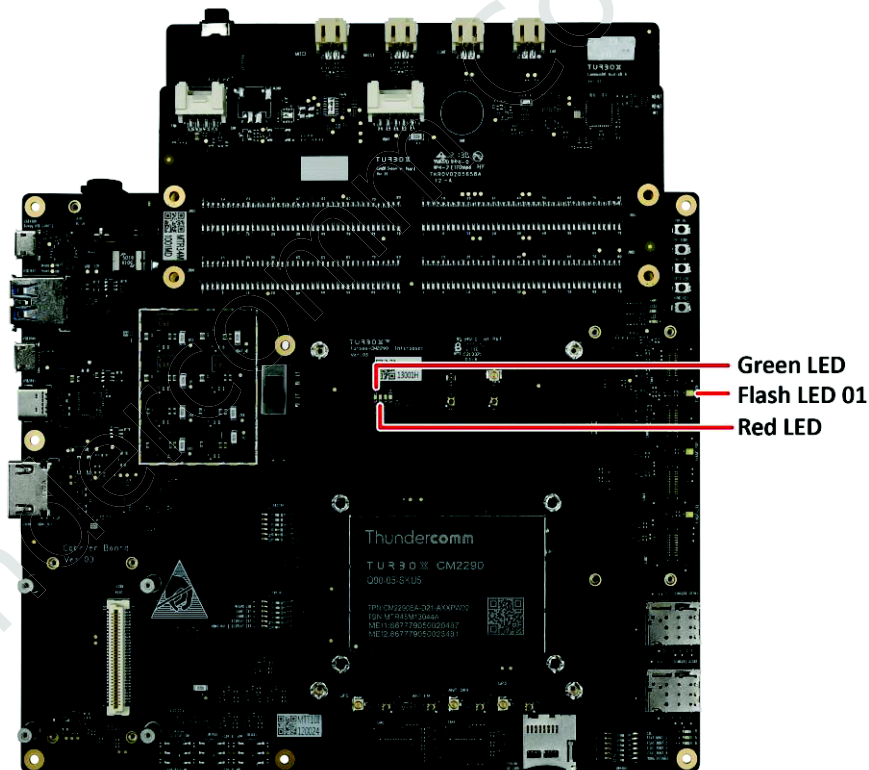


Figure 3-4. Locate LEDs

Run the following commands to test LEDs.

```
Test Red & Green LED
# echo 255 > /sys/class/leds/red/brightness // Turn on the red led
# echo 0 > /sys/class/leds/red/brightness // Turn off the red led
# echo 255 > /sys/class/leds/green/brightness // Turn on the green led
# echo 0 > /sys/class/leds/green/brightness // Turn off the green led
```

```
Test Flash LED Torch mode
# echo 0 > /sys/class/leds/led:switch_0/brightness
# echo 10 > /sys/class/leds/led:torch_0/brightness
# echo 1 > /sys/class/leds/led:switch_0/brightness
# echo 1000 > /sys/class/leds/led:torch_0/brightness
```

charge LED control by USB plug in/out

## 3.6. Buttons

No.1 – No.5 in [Figure 1-2](#)

**Table 3-1.Button specifications**

| Botton         | Device node       |
|----------------|-------------------|
| Power on       | /dev/input/event0 |
| Volume up      | /dev/input/event2 |
| Volume down    | /dev/input/event0 |
| Force_USB Boot | -                 |
| Home key       | -                 |

➤ **NOTE:** The **Force\_USB BOOT** button is used to force the system enter emergency download mode.

Execute the following commands, then press the buttons respectively for the corresponding information.

```
$ adb shell
# getevent
add device 1: /dev/input/event4
  name: "bengal-scubaidp-snd-card Button Jack"
add device 2: /dev/input/event3
  name: "bengal-scubaidp-snd-card Headset Jack"
add device 3: /dev/input/event1
  name: "goodix-ts"
add device 4: /dev/input/event0
  name: "qpnp_pon"
add device 5: /dev/input/event2
  name: "gpio-keys"
```

## 3.7. Wi-Fi and Bluetooth connection

### 3.7.1. Connect to Wi-Fi network

Step 1. Refer to Figure 3-5 to connect the Wi-Fi antenna to the board.

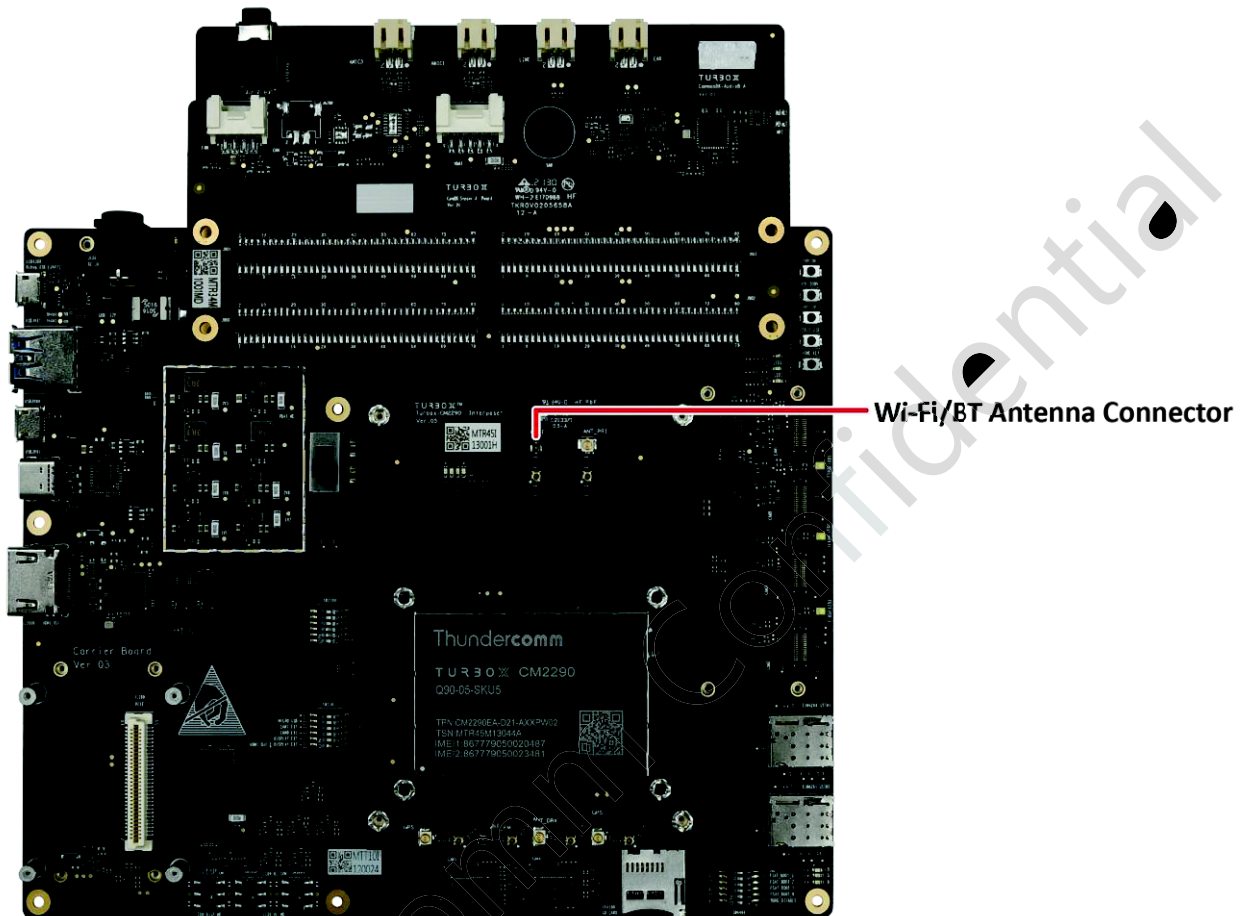


Figure 3-5. Connect Wi-Fi/BT Antenna

Step 2. Turn on your device.

Step 3. Swipe downwards shortly from the top edge of the screen to enter **Quick Settings** bar.

Step 4. Tap the **Wi-Fi** icon to enter into the Wi-Fi Settings.

Step 5. Turn on Wi-Fi switch.

Step 6. Tap the network name you prefer to connect and enter password (Networks that require password have a lock icon marked).

Step 7. Confirm the connection with an IP obtained.

```
# ifconfig wlan0
wlan0    Link encap:Ethernet  HWaddr 26:2d:69:ef:dc:8c  Driver icnss
         inet addr:192.168.2.136  Bcast:192.168.2.255  Mask:255.255.255.0
         inet6 addr: fe80::c641:f446:4eb3:d5eb/64  Scope: Link
         UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
         RX packets:225 errors:0 dropped:0 overruns:0 frame:0
         TX packets:245 errors:0 dropped:0 overruns:0 carrier:0
         collisions:0 txqueuelen:3000
         RX bytes:94690 TX bytes:35482
```

Step 8. Perform a ping test.

```
# ping www.baidu.com
PING www.baidu.com (23.59.93.51): 56 data bytes
64 bytes from 23.59.93.51: seq=0 ttl=48 time=171.722 ms
64 bytes from 23.59.93.51: seq=1 ttl=48 time=163.070 ms
64 bytes from 23.59.93.51: seq=2 ttl=48 time=244.932 ms
64 bytes from 23.59.93.51: seq=3 ttl=48 time=166.135 ms
```

### 3.7.2. Hotspot setup

Step 1. Swipe downwards shortly from the top edge of your screen to enter Quick Settings bar.

Step 2. Tap **Hotspot** icon .

🔔 **NOTE:**

- If you cannot find the **Hotspot** icon , tap **Edit** icon  at the bottom-left corner of your screen and drag **Hotspot** icon  into your **Quick Settings** bar.
- You can change the AP name and password by tapping **Setting > Network and Internet > Hotspot & Tethering > Wi-Fi Hotspot**

Step 3. Use your phone to connect the Wi-Fi network you have set up.

### 3.7.3. Connect to a Bluetooth-enabled device

Step 1. Swipe downwards shortly from the top edge of the screen to enter **Quick Settings** bar.

Step 2. Tap **Bluetooth** icon  to turn on Bluetooth connection function.

Step 3. Holding the **Bluetooth** icon to enter Bluetooth setting interface.

Step 4. Tap **Pair new device** to search the Bluetooth-enabled device around.

- 🔔 **NOTE:** If you cannot find **Pair new device** option, check the Bluetooth list under **Available devices**, or tap **More**/ to refresh.

Step 5. Tap the Bluetooth name to pair the Bluetooth-enabled device with your device.

### 3.8. Speaker connector

Step 1. Refer to Figure 3-6 to connect a speaker to the board.

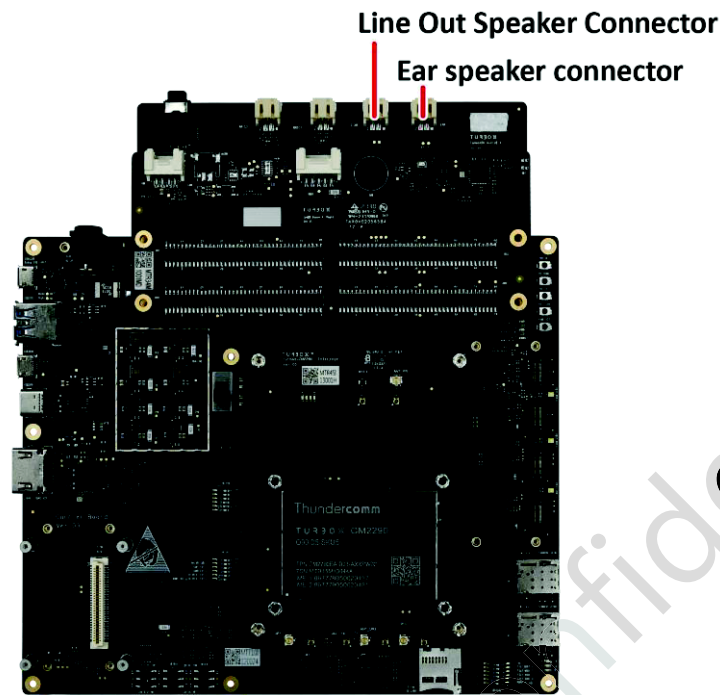


Figure 3-6. Speaker Connectors

Step 2. Push an mp3 file to your device.

```
$ adb push 1.mp3 /storage/emulated/0/Music
```

Step 3. Play the .mp3 file in **Music Player**, and the voice will come out from the speaker.

### 3.9. Headset connector

No.41 in [Figure 1-2](#)

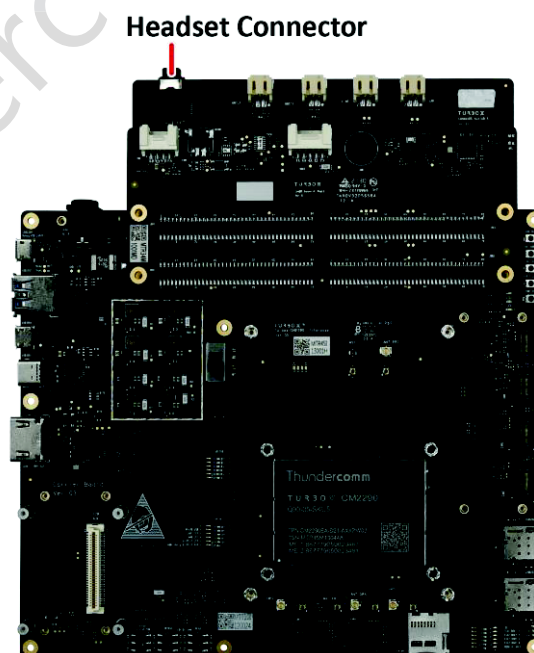


Figure 3-7. Headset Connector

Step 1.Boot up your system.

Step 2.Push an mp3 file to your device.

```
$ adb push 1.mp3 /storage/emulated/0/Music
```

Step 3.Play the .mp3 file in **Music Player**, and the voice will come out from the handset.

### 3.10. Camera module connector

Two camera module connectors (No.8 and No.10 in [Figure 1-2](#) ) are available.

Default: **Camera module connector 0**.

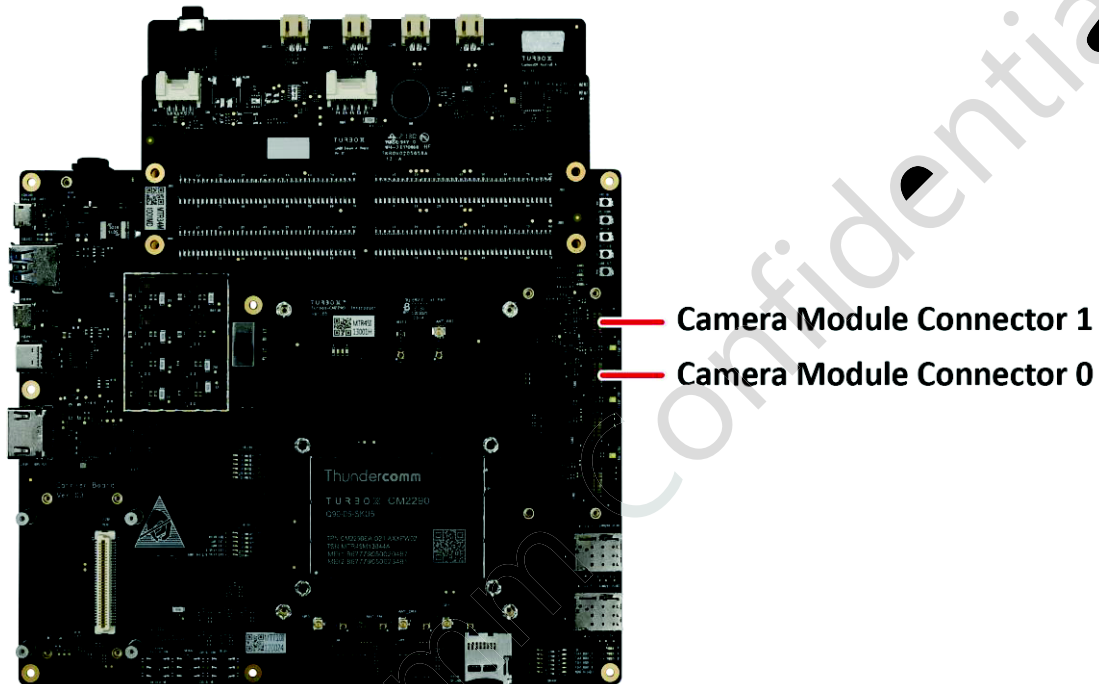


Figure 3-8.Camera Module Connectors

Step 1.Set the Dip Switch. Refer to [Table 1-3](#).

- SW1301: Toggle 3 to OFF
- SW1301: Toggle 4 to OFF
- SW2200: Toggle 2 to ON
- SW2200: Toggle 3 to ON

Step 2.Boot up your system.

Step 3.Open the **Snapdragon Camera** app to take pictures or record videos.

### 3.11. SIM card slot

Step 1. Connect antennas to the board via the **Primary antenna connector** (No. 7 in [Figure 1-2](#)) and **Discontinuous reception antenna connector** (No. 22 in [Figure 1-2](#)).

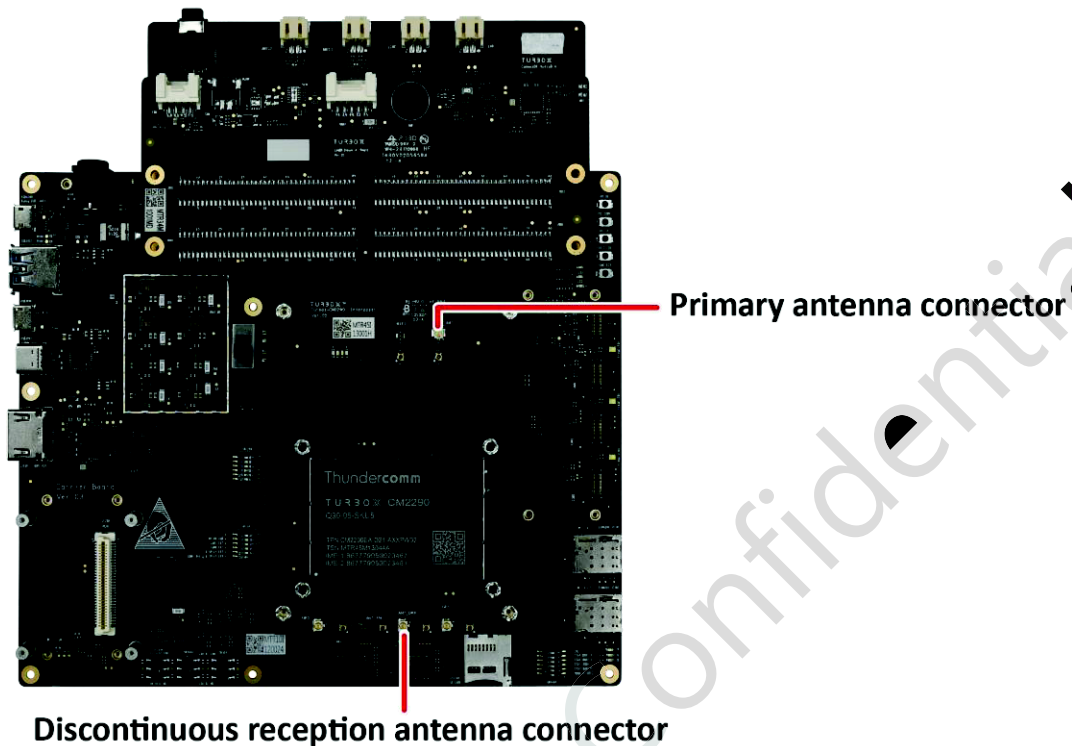


Figure 3-9. Antenna Connectors

Step 2. Properly insert a SIM card to either of the **SIM card slots** (No.16 and No.17 in [Figure 1-2](#)) .

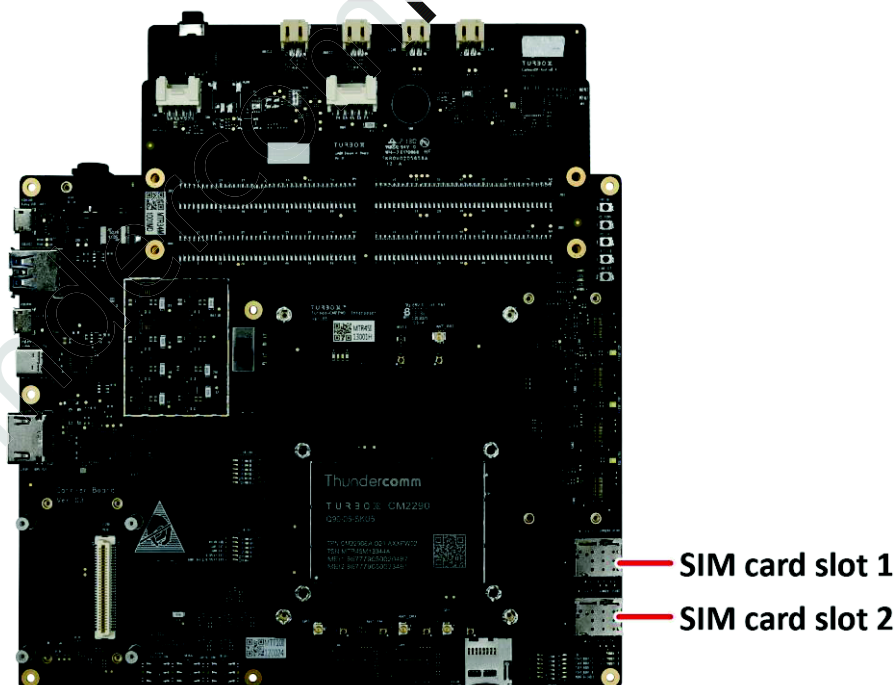


Figure 3-10. SIM Card Slots

Step 3. Boot up your system to check the LTE signal.

### 3.12. HDMI out

Step 1. Power off the device.

Step 2. Connect an HDMI cable to the board via the **HDMI out connector** (No.27 in [Figure 1-2](#)).

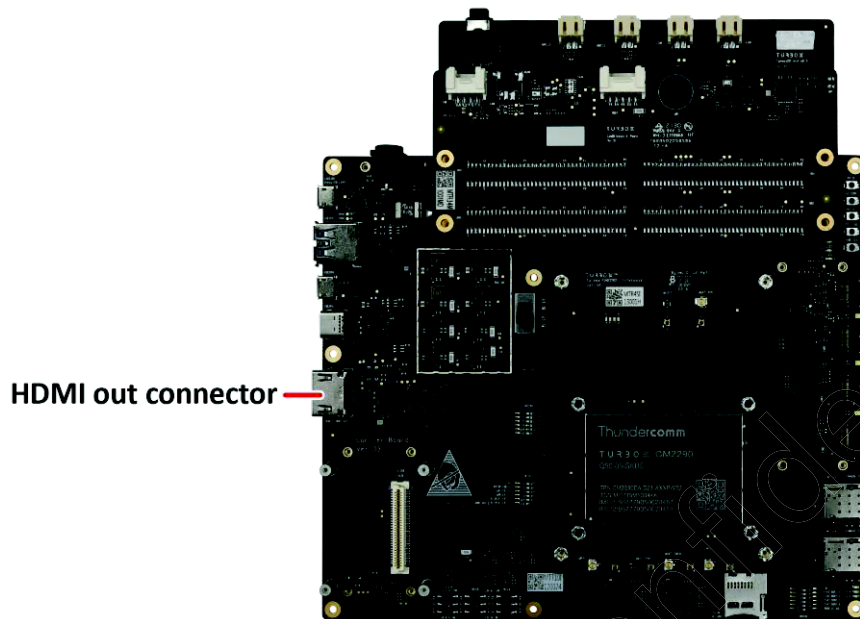


Figure 3-11. HDMI out

Step 3. Set the Dip switches. Refer to [Table 1-3](#).

- SW1301: toggle 1 to ON
- SW2200: toggle 2 to OFF
- SW2200: toggle 3 to OFF

Step 4. Press the **Power on button** to boot up the system.

Step 5. Enter the following commands to start HDMI display.

```
$ adb root
$ adb reboot bootloader
$ fastboot oem select-display-panel truly_ext_hd_plus_vid
$ fastboot reboot
```

Then the following HDMI screen will appear.

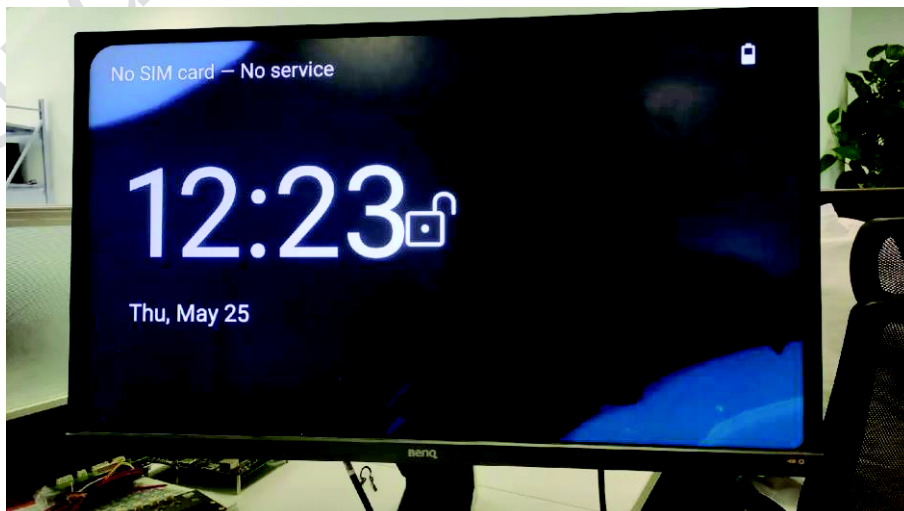


Figure 3-12. HDMI Screen

Step 6. If you need to switch back to the LCD display, set the DIP switches (see [Step 4 of 3.3. Display panel connector \(for LCM\)](#)) and enter the following commands:

```
$ adb root
$ adb reboot bootloader
$ fastboot oem select-display-panel truly_ili9881p_720_vid
$ fastboot reboot
```

➔ **NOTE:** If there is no firmware programmed in the LT9611UXC chip of the DK board, after switching to HDMI output, the firmware of the lt9611uxc chip will be upgraded for the first time bootup, and the upgrade will be carried out automatically. Meanwhile, you can see the following upgrade log in the serial port.

```
console:/ # dmesg | grep 9611
[ 7.813523] lt9611_parse_dt: irq_gpio=1192
[ 7.813612] lt9611_parse_dt: reset_gpio=1200
[ 7.813685] lt9611_parse_dt: hdmi ps gpio not specified
[ 7.813760] lt9611_parse_dt: hdmi en gpio not specified
[ 7.813834] lt9611_parse_dt: i2s_sel_hdmi_gpio not specified
[ 7.813907] lt9611_parse_dt: i2s_sel_gpio not specified
[ 7.813980] lt9611_parse_dt: hdmi mux1 gpio not specified
[ 7.814054] lt9611_parse_dt: hdmi mux2 gpio not specified
[ 7.814069] lt9611_parse_dt: ac_mode=0
[ 7.814083] lt9611_parse_dt: non_pluggable = 1
[ 7.814177] lt9611_parse_dt_modes: mode[1920x1080] h[1920,2008,2052,2200]
v[1080,1084,1089,1125] 60 5 148500kHz
[ 7.814198] lt9611_get_dt_supply: no supply entry present
[ 7.819901] lt9611_reset: reset: 1
[ 7.898634] lt9611_read_device_id: LT9611 id: 0x1704
[ 8.109122] lt9611_get_version: LT9611 revision: 0x41
[ 8.115373] lt9611 1-002b: Falling back to syfs fallback for: lt9611_fw.bin
[ 8.270463] lt9611_irq_thread_handler: irq_thread_handler
[ 8.690053] lt9611_irq_thread_handler: irq_thread_handler
[ 22.769119] lt9611_firmware_upgrade: LT9611 FW total size 16849
[ 22.799835] lt9611_block_erase: LT9611 block erase
[ 25.832194] lt9611_block_erase: LT9611 block erase
[ 42.961177] vdc: Waited 0ms for vold
[ 51.409611] qcom,camera 5c1b000.qcom,cci0:qcom,cam-sensor1: Dropping the link to
regulator.48
[ 71.028228] lt9611_firmware_write: LT9611 FW write over, total size: 16849, page:
526, reset: 17
[ 73.197121] lt9611_firmware_upgrade: LT9611 Firmware upgrade success.
```

If the following log appears, it indicates that the lt9611uxc firmware has been successfully upgraded. Restart the system, and HDMI will be displayed normally.

```
[ 73.197121] lt9611_firmware_upgrade: LT9611 Firmware upgrade success.
```

# Appendix 1. Compliance and Certificate Information

## Federal Communication Commission Interference Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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 in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, 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 of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and 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.

### FCC Caution:

- Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.
- This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
- Operations in the 5.15-5.25GHz band are restricted to indoor usage only.

**Radiation Exposure Statement:**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

**This device is intended only for OEM integrators under the following conditions:**

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and the maximum antenna gain allowed for use with this device is 4.8 dBi.
- 2) The transmitter module may not be co-located with any other transmitter or antenna.
- 3) For portable usage condition, this module has been SAR evaluated in  
**Product name: TurboX CM2290-NA, Model: TurboX CM2290-NA** host with compliance result and can be used with this specific host as described in the certification filing. Other host or platform needs separate approval.

As long as 3 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

**IMPORTANT NOTE:** In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

**End Product Labeling**

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: “**Contains FCC ID: 2AOHHCM2290NA**”. The grantee's FCC ID can be used only when all FCC compliance requirements are met.

**Manual Information To the End User**

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

Flex Antenna Gain :  
BT and 2.4 Wi-Fi: 3 dBi  
5G Wi-Fi: 4 dBi  
LTE: 4.8 dBi

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