QUICK START GUIDE

VIA SOM-7000

Android 13.0 EVK

1.02-29102024

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Revision History

Version	Date	Remarks
1.02	29/10/2024	Replaced mentions of "Starter Kit" with "Evaluation Kit".
1.01	21/05/2024	Updated images of the VIA SOMDB7 carrier board rear and onboard I/O in sections 2.1 and 3.1. Updated the VIA SOM-7000 supported features list in section 1.2.
1.00	29/02/2024	Initial release

Table of Contents

1. Introduction

This Quick Start Guide provides an overview of how to boot the Android image for the VIA SOM-7000 Evaluation Kit and configure the supported hardware functions in the build.

Note:
The VIA SOM-7000 Evaluation Kit includes the VIA SOM-7000 module and VIA SOMDB7 reference carrier board.

The VIA SOM-7000 Android 13.0 EVK is developed based on the MediaTek Android 13.0 BSP, and it enables the hardware features of the VIA SOM-7000 Evaluation Kit.

1.1 EVK Package Contents

There are three folders in the package listed as below.

Firmware folder	Description
VIA_SOM-7000_Android_13.0_EVK.zip	Android evaluation image
Document folder	**Description**
VIA_SOM-7000_Android_13.0_EVK_Quick_Start_Guide.pdf	Quick Start Guide
Tool folder	**Description**
PoseDetector_Image.apk	Sample test program
android.py	A python script

1.1.1 Firmware Folder Contents

VIA_SOM-7000_Android_13.0_EVK.zip: Contains the precompiled Android image for evaluating the VIA SOM-7000 Evaluation Kit.

1.1.2 Document Folder Contents

VIA_SOM-7000_Android_13.0_EVK_Quick_Start_Guide.pdf: This Quick Start Guide provides an overview on how to boot the Android image for the VIA SOM-7000 Evaluation Kit and configure the supported hardware functions in the build.

1.1.3 Tool Folder Contents

PoseDetector_Image.apk: A sample program to test MTK NeuroPilot AI APU hardware acceleration.

android.py: A python script to install the Android evaluation image.

1.2 Version Information and Supported Features

- Kernel version: 5.15.94
- Evaluation image: Android 13.0
- Development based on MediaTek Android 13.0 BSP
- Supports eMMC boot
- Supports HDMI 4K display and audio outputs
- Supports MIPI DSI capacitive touch panels:
  - NuWhole 7" NT070R11-12ACR5 (1200 x 1920)
  - Goodix I2C touch
- Supports debugging using the debug console
- Supports RGMII and USB 3.0 Gigabit Ethernet
- Supports MediaTek MT6365 Headphone-out and Mic-in
- Supports MediaTek MT7921 dual-band Wi-Fi 6 (with MU-MIMO) and Bluetooth 5.2
- Supports the optional 4G LTE mobile broadband M.2 modules:
  - Telit LN920A6
  - Quectel EM05-G
- Supports the optional MIPI CSI IMX258 and OV5648 camera modules
- Supports MediaTek NeuroPilot AI APU hardware acceleration

2. Image Installation

This section explains the setup requirements for installing the Android evaluation image on the VIA SOM-7000 Evaluation Kit.

The precompiled images are provided in the "Firmware" folder.

2.1 Installing with the Genio Tool

Follow the steps below to install the Android evaluation image:

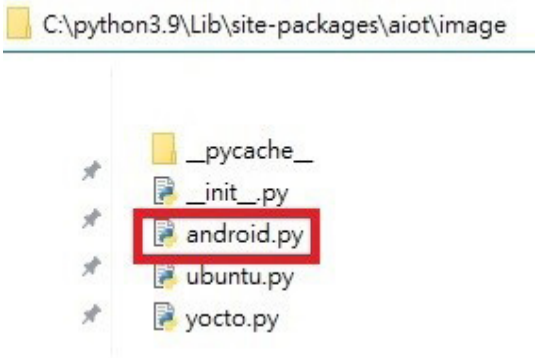
Step 1

Refer to the instructions described in the following sections of the MediaTek IoT Environment Setup and set up the Genio tool environment on a Windows 10 host machine:

- Setup Git for Windows
- Install Fastboot and ADB Device USB Driver
- Install Fastboot Tool on Windows
- Setup Python 3 on Windows
- Install Genio Tools

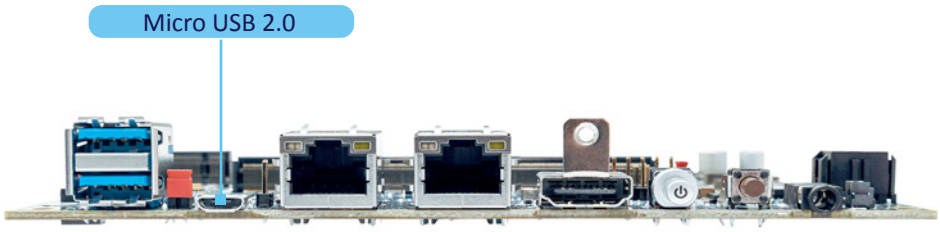
Step 2

Copy the "android.py" file to the "C:\python3.9\Lib\site-packages\aiot\image" directory replacing the original file on the Windows 10 host machine.



Step 3

Connect the Windows 10 host machine and the VIA SOM-7000 Evaluation Kit through the Micro USB 2.0 port using a Micro USB cable. The Micro USB 2.0 port is located on the back panel of the VIA SOM-7000 Evaluation Kit.



Micro USB 2.0 port

Step 4

Extract the Android 13.0 evaluation image package "VIA_SOM-7000_Android_13.0_EVK.zip" on the Windows 10 host machine.

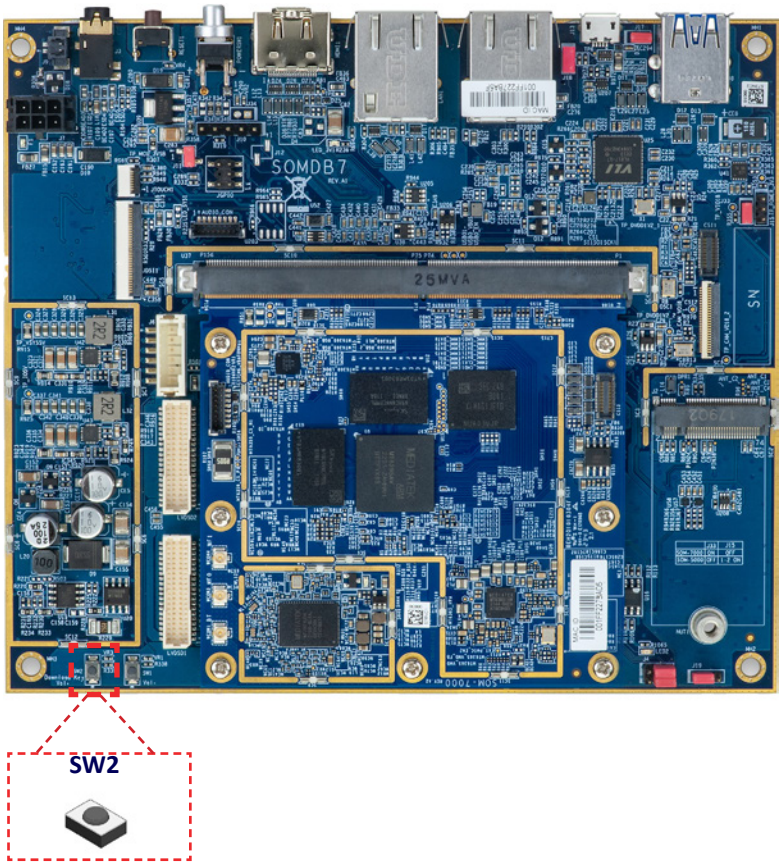
Step 5

The VIA SOM-7000 Evaluation Kit's storage must first be formatted completely to allow clean installation of the Android evaluation image later. Set the path to the "platform tools" folder, and run the "genio-flash" command. When prompted, select option 1 "Format All".

```
D:\VIA_SOM-7000_Android_13.0_EVK>set PATH=D:\platform-tools;%PATH%
D:\VIA_SOM-7000_Android_13.0_EVK>genio-flash
1: Format All
2: Flash Image
choice: 1
```

Step 6

Next, press and hold the SW2 download key located on the top layer of the VIA SOM-7000 Evaluation Kit, and plug in the AC-to-DC power adapter. The VIA SOM-7000 Evaluation Kit will automatically power on and start formatting its storage.



Location of the SW2 key

Note:
After powering on the VIA SOM-7000 Evaluation Kit, make sure the Windows 10 host machine detects it as an ADB device.

Step 7

When the formatting process is complete, release the SW2 download key. Confirmation messages will be printed as shown below.

```
D:\VIA_SOM-7000_Android_13.0_EVK>set PATH=D:\platform-tools;%PATH%
D:\VIA_SOM-7000_Android_13.0_EVK>genio-flash
1: Format All
2: Flash Image
choice: 1

Android Image:
        system:  Android

Looking for MediaTek SoC matching USB device 0e8d:0003
Opening COM5 using baudrate=115200
Connected to MediaTek SoC: hw_code[0x8195]
Sending bootstrap to address: 0x201000
Jumping to bootstrap at address 0x201000 in AArch64 mode
erasing mmc0boot0
Erasing 'mmc0boot0'                                (bootloader) request sz: 0x400000, real
erase len: 0x400000
OKAY [  0.010s]
Finished. Total time: 0.010s
erasing mmc0boot1
Erasing 'mmc0boot1'                                (bootloader) request sz: 0x400000, real
erase len: 0x400000
OKAY [  0.000s]
Finished. Total time: 0.011s
erasing mmc0
Erasing 'mmc0'                                     (bootloader) request sz: 0x3a3e00000,
real erase len: 0x0
OKAY [  0.531s]
Finished. Total time: 0.532s
flashing mmc0boot0=preloader.img
Warning: skip copying mmc0boot0 image avb footer (mmc0boot0 partition size: 0, mmc0boot0
image size: 407176).
Sending 'mmc0boot0' (397 KB)                       OKAY [  0.012s]
Writing 'mmc0boot0'                                OKAY [  0.022s]
Finished. Total time: 0.077s
flashing mmc0boot1=preloader.img
Warning: skip copying mmc0boot1 image avb footer (mmc0boot1 partition size: 0, mmc0boot1
image size: 407176).
Sending 'mmc0boot1' (397 KB)                       OKAY [  0.016s]
Writing 'mmc0boot1'                                OKAY [  0.031s]
Finished. Total time: 0.062s
flashing mmc0=via.gpt
Warning: skip copying mmc0 image avb footer (mmc0 partition size: 0, mmc0 image size:
32768).
Sending 'mmc0' (32 KB)                             OKAY [  0.000s]
Writing 'mmc0'                                     OKAY [  0.078s]
Finished. Total time: 0.094s
Rebooting                                          OKAY [  0.000s]
Finished. Total time: 0.000s

D:\VIA_SOM-7000_Android_13.0_EVK>
```

Step 8

Unplug the AC-to-DC power adapter to power off the VIA SOM-7000 Evaluation Kit.

Step 9

The VIA SOM-7000 Evaluation Kit is now ready to be flashed with the provided Android evaluation image. Set the path to the "platform tools" folder, and run the "genio-flash" command. When prompted, select option 2 "Flash Image".

```
D:\VIA_SOM-7000_Android_13.0_EVK>set PATH=D:\platform-tools;%PATH%
D:\VIA_SOM-7000_Android_13.0_EVK>genio-flash
1: Format All
2: Flash Image
choice: 2
```

Step 10

Next, press and hold the SW2 download key, and plug in the AC-to-DC power adapter. The VIA SOM-7000 Evaluation Kit will automatically power on.

Note:
After powering on the VIA SOM-7000 Evaluation Kit, make sure the Windows 10 host machine detects it as an ADB device.

Step 11

Messages will start printing to show that the flashing process is loading, and will then pause to find the VIA SOM-7000 Evaluation Kit in bootloader mode. When the VIA SOM-7000 Evaluation Kit is found, the flashing process will begin and messages will start printing to show its progress. When the first message is printed, release the SW2 download key.

```
D:\VIA_SOM-7000_Android_13.0_EVK>set PATH=D:\platform-tools;%PATH%
D:\VIA_SOM-7000_Android_13.0_EVK>genio-flash
1: Format All
2: Flash Image
choice: 2

Android Image:
        system:  Android

Looking for MediaTek SoC matching USB device 0e8d:0003
Opening COM5 using baudate=115200
Connected to MediaTek SoC: hw code [0x8195]
Sending bootstrap to address: 0x201000
Jumping to bootstrap at address 0x201000 in AArch64 mode
flashing vbmeta_a=vbmeta.img
< waiting for any device >
Sending 'vbmeta_a' (8 KB)                          OKAY [  0.005s]
Writing 'vbmeta_a'                                 OKAY [  0.005s]
Finished. Total time: 0.030S
```

Step 12

When the flashing process is complete, confirmation messages will be printed as shown below.

```
D:\VIA_SOM-7000_Android_13.0_EVK>set PATH=D:\platform-tools;%PATH%
D:\VIA_SOM-7000_Android_13.0_EVK>genio-flash
1: Format All
2: Flash Image
choice: 2

Android Image:
        system:  Android

Looking for MediaTek SoC matching USB device 0e8d:0003
Opening COM5 using baudrate=115200
Connected to MediaTek SoC: hw_code[0x8195]
Sending bootstrap to address: 0x201000
Jumping to bootstrap at address 0x201000 in AArch64 mode
flashing vbmeta_a=vbmeta.img
< waiting for any device >
```

```
Sending 'vbmeta_a' (8 KB)                          OKAY [  0.005s]
Writing 'vbmeta_a'                                 OKAY [  0.005s]
Finished. Total time: 0.030s
flashing vbmeta_system_a=vbmeta_system.img
Sending 'vbmeta_system_a' (4 KB)                   OKAY [  0.005s]
Writing 'vbmeta_system_a'                          OKAY [  0.005s]
Finished. Total time: 0.025s
flashing md1img_a=md1img.img
Sending 'md1img_a' (4 KB)                          OKAY [  0.000s]
Writing 'md1img_a'                                 OKAY [  0.011s]
Finished. Total time: 0.021s
flashing md1dsp_a=md1dsp.img
Sending 'md1dsp_a' (4 KB)                          OKAY [  0.006s]
Writing 'md1dsp_a'                                 OKAY [  0.004s]
Finished. Total time: 0.351s
flashing vbmeta_vendor_a=vbmeta_vendor.img
Sending 'vbmeta_vendor_a' (4 KB)                   OKAY [  0.003s]
Writing 'vbmeta_vendor_a'                          OKAY [  0.000s]
Finished. Total time: 0.056s
flashing spmfw_a=spmfw.img
Sending 'spmfw_a' (14 KB)                          OKAY [  0.002s]
Writing 'spmfw_a'                                  OKAY [  0.006s]
Finished. Total time: 0.026s
flashing pi_img_a=pi_img.img
Sending 'pi_img_a' (6 KB)                          OKAY [  0.000s]
Writing 'pi_img_a'                                 OKAY [  0.016s]
Finished. Total time: 0.031s
flashing dpm_a=dpm.img
Sending 'dpm_a' (134 KB)                           OKAY [  0.000s]
Writing 'dpm_a'                                    OKAY [  0.003s]
Finished. Total time: 0.107s
flashing scp_a=scp.img
Sending 'scp_a' (228 KB)                           OKAY [  0.000s]
Writing 'scp_a'                                    OKAY [  0.016s]
Finished. Total time: 0.031s
flashing sspm_a=sspm.img
Sending 'sspm_a' (574 KB)                          OKAY [  0.000s]
Writing 'sspm_a'                                   OKAY [  0.031s]
Finished. Total time: 0.094s
flashing mcupm_a=mcupm.img
Sending 'mcupm_a' (449 KB)                         OKAY [  0.031s]
Writing 'mcupm_a'                                  OKAY [  0.016s]
Finished. Total time: 0.094s
flashing cam_vpu1_a=cam_vpu1.img
Sending 'cam_vpu1_a' (3048 KB)                     OKAY [  0.071s]
Writing 'cam_vpu1_a'                               OKAY [  0.113s]
Finished. Total time: 0.206s
flashing cam_vpu2_a=cam_vpu2.img
Sending 'cam_vpu2_a' (8223 KB)                     OKAY [  0.207s]
Writing 'cam_vpu2_a'                               OKAY [  0.295s]
Finished. Total time: 0.537s
flashing cam_vpu3_a=cam_vpu3.img
Sending 'cam_vpu3_a' (470 KB)                      OKAY [  0.012s]
Writing 'cam_vpu3_a'                               OKAY [  0.022s]
Finished. Total time: 0.053s
flashing apusys_a=apusys.img
Sending 'apusys_a' (1116 KB)                       OKAY [  0.030s]
Writing 'apusys_a'                                 OKAY [  0.053s]
Finished. Total time: 0.145s
flashing lk_a=lk.img
Sending 'lk_a' (1149 KB)                           OKAY [  0.016s]
Writing 'lk_a'                                     OKAY [  0.062s]
Finished. Total time: 0.125s
flashing boot_a=boot.img
Sending 'boot_a' (65536 KB)                        OKAY [  1.448s]
Writing 'boot_a'                                   OKAY [  2.330s]
Finished. Total time: 3.793s
flashing init_boot_a=init_boot.img
Sending 'init_boot_a' (8192 KB)                    OKAY [  0.172s]
Writing 'init_boot_a'                              OKAY [  0.281s]
Finished. Total time: 0.500s
```

```
flashing vendor_boot_a=vendor_boot.img
Sending 'vendor_boot_a' (65536 KB)                 OKAY [  1.437s]
Writing 'vendor_boot_a'                            OKAY [  2.337s]
Finished. Total time: 3.790s
flashing dtbo_a=dtbo.img
Sending 'dtbo_a' (8192 KB)                         OKAY [  0.188s]
Writing 'dtbo_a'                                   OKAY [  0.301s]
Finished. Total time: 0.505s
flashing tee_a=tee.img
Sending 'tee_a' (2280 KB)                          OKAY [  0.047s]
Writing 'tee_a'                                    OKAY [  0.094s]
Finished. Total time: 0.172s
flashing logo_a=logo.img
Sending 'logo_a' (1811 KB)                         OKAY [  0.047s]
Writing 'logo_a'                                   OKAY [  0.078s]
Finished. Total time: 0.156s
flashing apusys_b=apusys.img
Sending 'apusys_b' (1116 KB)                       OKAY [  0.031s]
Writing 'apusys_b'                                 OKAY [  0.047s]
Finished. Total time: 0.109s
flashing super=super.img
Sending sparse 'super' 1/6 (262140 KB)             OKAY [  5.789s]
Writing 'super'                                    OKAY [  9.311s]
Sending sparse 'super' 2/6 (244540 KB)             OKAY [  5.392s]
Writing 'super'                                    OKAY [  8.677s]
Sending sparse 'super' 3/6 (262140 KB)             OKAY [  5.731s]
Writing 'super'                                    OKAY [  9.314s]
Sending sparse 'super' 4/6 (246380 KB)             OKAY [  5.406s]
Writing 'super'                                    OKAY [  8.753s]
Sending sparse 'super' 5/6 (262140 KB)             OKAY [  5.865s]
Writing 'super'                                    OKAY [  9.297s]
Sending sparse 'super' 6/6 (250140 KB)             OKAY [  5.575s]
Writing 'super'                                    OKAY [  8.881s]
Finished. Total time: 88.083s
flashing userdata=userdata.img
Sending 'userdata' (16580 KB)                      OKAY [  0.375s]
Writing 'userdata'                                 OKAY [  0.603s]
Finished. Total time: 1.040s
Rebooting                                          OKAY [  0.000s]
Finished. Total time: 0.000s

D:\VIA_SOM-7000_Android_13.0_EVK>
```

Step 13

Unplug the AC-to-DC power adapter to power off the VIA SOM-7000 Evaluation Kit.

Step 14

Unplug the Micro USB cable, press the Power Button for 2 seconds and release it to power on the VIA SOM-7000 Evaluation Kit.

When the boot process has completed, you will see the Android 13.0 desktop.

3. Hardware Functions

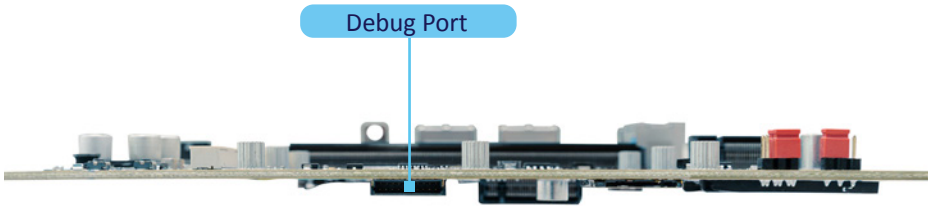
This section explains how to enable and test the hardware functions precompiled in the VIA SOM-7000 Android 13.0 EVK.

3.1 Using the Debug Console

Follow the steps below to use the debug console:

Step 1

Connect the Windows 10 host machine and the VIA SOM-7000 Evaluation Kit through the "J14" debug port using the provided debug cable. The "J14" debug port is located on the front panel of the VIA SOM-7000 Evaluation Kit.



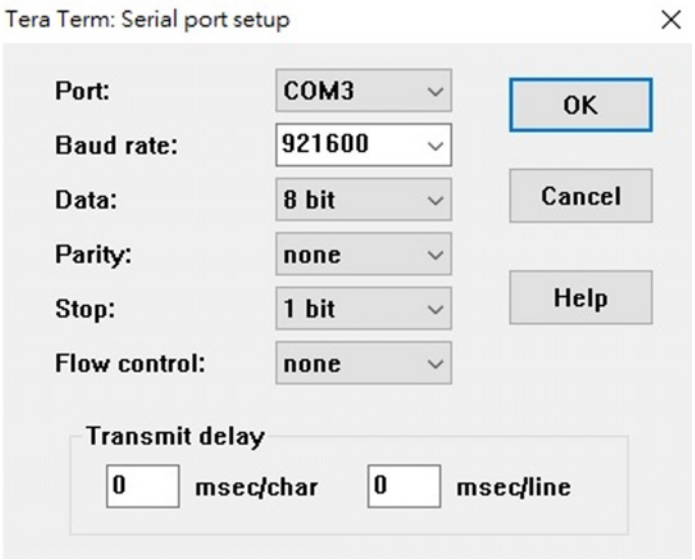
J14 Debug Port

Step 2

Use a serial port communication program such as PuTTY or Tera Term to connect the debug console.

Step 3

Select the correct serial port and set the Console Baud Rate to "921600".



Step 4

Power on the VIA SOM-7000 Evaluation Kit to initiate the boot process.

Step 5

When the VIA SOM-7000 Evaluation Kit has completed booting, press "Enter" to log in to the debug console. The debug console command mode prompt "console:/ $" will be displayed.

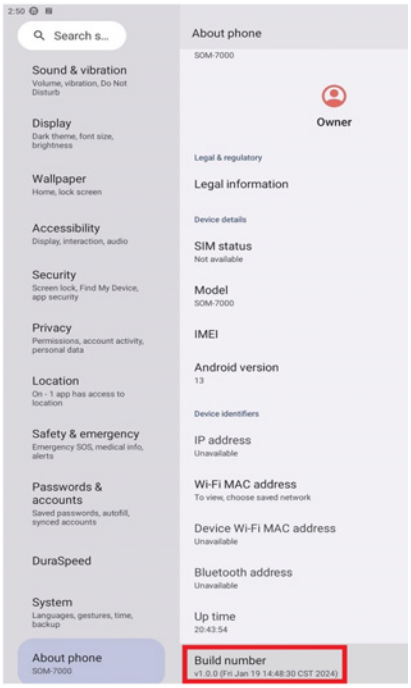
3.2 Changing the Kernel Debug Level

To disable the kernel messages, modify the debug level using the following command:

```
console:/ # su
console:/ # echo 3 > /proc/sys/kernel/printk
```

3.3 Checking the BSP Version

To check the BSP version, navigate to "Settings > About phone" and check the "Build number".



3.4 DVFS

To verify the DVFS (Dynamic Voltage Frequency Scaling) function and list all the supported features, use the following commands:

```
console:/ # ls -l /sys/devices/system/cpu/cpu0/cpufreq/
total 0
-r--r--r-- 1 root   root   4096 2023-07-11 13:43 affected_cpus
-r-------- 1 root   root   4096 2023-07-11 13:43 cpuinfo_cur_freq
-r--r--r-- 1 root   root   4096 2023-07-11 13:43 cpuinfo_max_freq
-r--r--r-- 1 root   root   4096 2023-07-11 13:43 cpuinfo_min_freq
-r--r--r-- 1 root   root   4096 2023-07-11 13:43 cpuinfo_transition_latency
-r--r--r-- 1 root   root   4096 2010-01-01 00:00 related_cpus
-r--r--r-- 1 root   root   4096 2010-01-01 00:00 scaling_available_frequencies
-r--r--r-- 1 root   root   4096 2023-07-11 13:43 scaling_available_governors
-r--r--r-- 1 root   root   4096 2023-07-11 13:43 scaling_cur_freq
-r--r--r-- 1 root   root   4096 2023-07-11 13:43 scaling_driver
-rw-rw---- 1 system system 4096 2023-07-11 11:20 scaling_governor
-rw-rw---- 1 system system 4096 2010-01-01 00:00 scaling_max_freq
-rw-rw-r-- 1 system system 4096 2010-01-01 00:00 scaling_min_freq
-rw-r--r-- 1 root   root   4096 2023-07-11 13:43 scaling_setspeed
drwxr-xr-x 2 root   root      0 2023-07-11 13:43 schedutil
drwxr-xr-x 2 root   root      0 2010-01-01 00:00 stats
console:/ #
```

To check the supported and current CPU frequency, use the following commands:

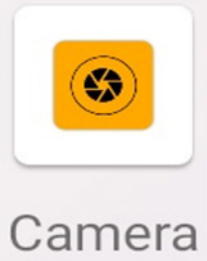
```
:~# cat /sys/devices/system/cpu/cpu0/cpufreq/scaling_available_frequencies
2000000 1903000 1807000 1710000 1614000 1517000 1421000 1325000 1228000 1132000 1035000
939000 842000 746000 650000 500000
:~# cat /sys/devices/system/cpu/cpu0/cpufreq/cpuinfo_cur_freq
500000
```

3.5 Display

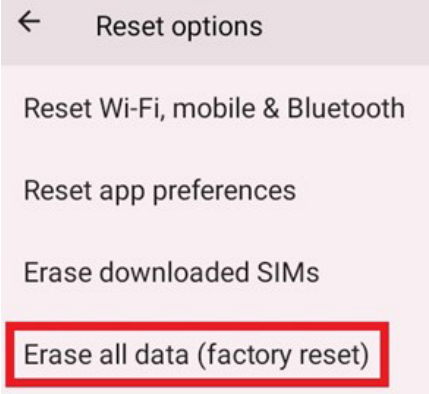
There is no need to set the display device. If you connect an HDMI display, HDMI output will be automatically enabled after booting. If you connect an LCD panel, LCD panel output will be automatically enabled after booting.

3.6 Camera

If a desired CSI camera module was connected correctly to the VIA SOM-7000 Evaluation Kit before booting the VIA SOM-7000 Evaluation Kit, a "Camera" APK can be found on the Android desktop. Click to open it and test the camera functions.



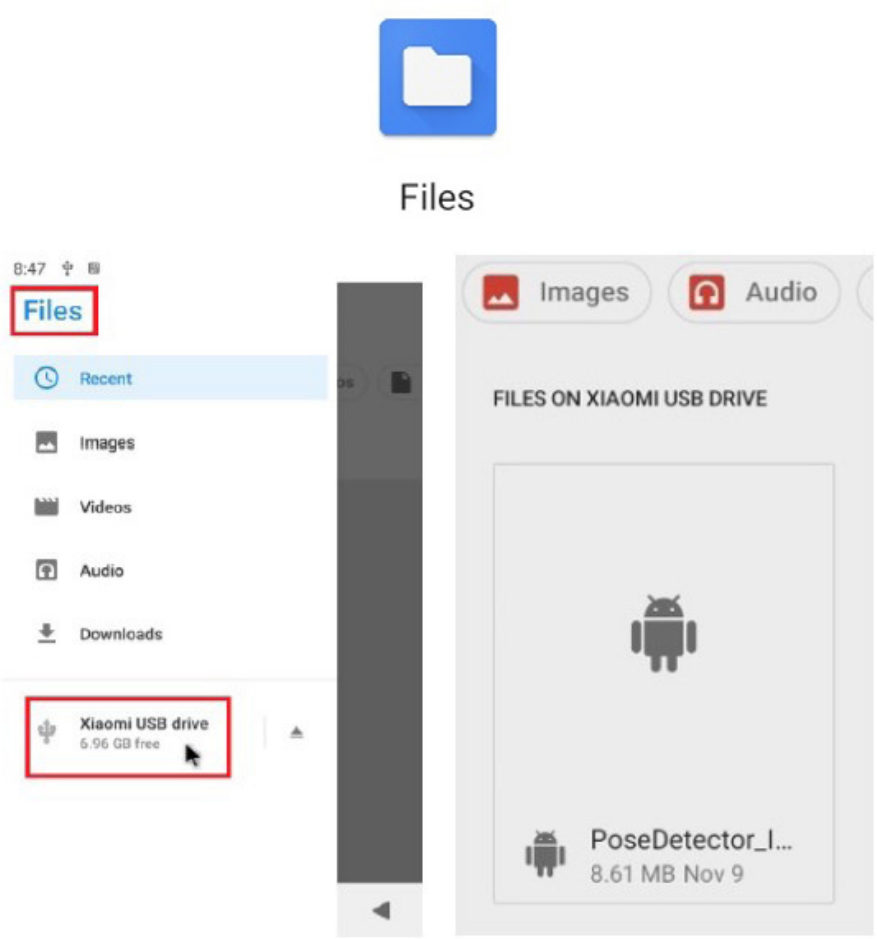
If the CSI camera module was connected correctly before booting the VIA SOM-7000 Evaluation Kit, but there is no "Camera" APK on the Android desktop, navigate to "Settings > System > Reset options" and click "Erase all data (factory reset)" to reboot. The "Camera" APK will be generated after the system reboots.



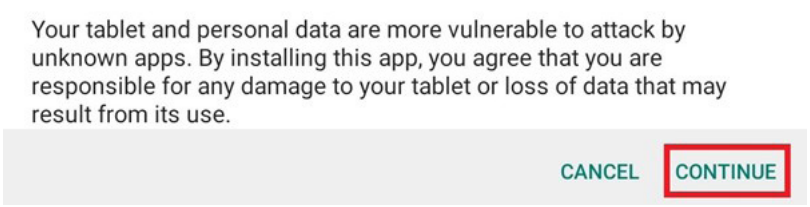
3.7 MTK NeuroPilot AI APU Hardware Acceleration

We recommend running the "PoseDetector_Image.apk" sample program for testing MTK NeuroPilot AI APU hardware acceleration. To install the program, follow the steps below:

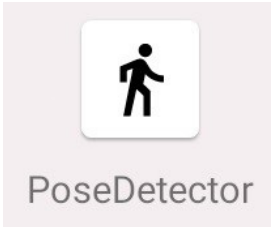
1. Copy the "PoseDetector_Image.apk" file to a USB drive and connect the USB drive to the VIA SOM-7000 Evaluation Kit.
2. Next, navigate to "Files" and click on the USB drive's name to find "PoseDetector_Image.apk" as shown below. Double-click the program.



3. When the program opens, it will display a dialog box as shown below. Click "Continue" to confirm.



4. After installation, double-click "PoseDetector" to run the program.



5. Check the Pose Detection inference time on the bottom left corner of the program:
   - If the inference time is less than 200ms, MTK NeuroPilot AI APU hardware acceleration is enabled and running correctly.
   - If the inference time is greater than 200ms, MTK NeuroPilot AI APU hardware acceleration is disabled.

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