



QUICK START GUIDE

VIA AI Transforma Model 1

Debian 12 OS



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Revision History

| Version | Date | Remarks |
|---------|------------|-----------------|
| 1.00 | 18/09/2024 | Initial release |

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1. Introduction

This Quick Start Guide provides an overview of how to boot the Debian 12 OS image on a VIA AI Transforma Model 1 board and configure the supported hardware functions for the build.

The Debian 12 OS image is developed based on the MediaTek Yocto 4.0.17 BSP and enables all HW functions provided by VIA AI Transforma Model 1 board.

1.1 OS Package Contents

There are two folders in the package listed below.

| Firmware folder | Description |
|--|--------------------|
| VIA_AI_Transforma_Model_1_Debain_12_OS.zip | Debian 12 OS image |
| Document folder | Description |
| VIA_AI_Transforma_Model_1_Debain_12_OS_Quick_Start_Guide.pdf | Quick Start Guide |

1.1.1 Firmware Folder Contents

VIA_AI_Transforma_Model_1_Debain_12_OS.zip: Contains the precompiled Debian 12 OS image for installing on VIA AI Transforma Model 1 board.

1.1.2 Document Folder Contents

VIA_AI_Transforma_Model_1_Debain_12_OS_Quick_Start_Guide.pdf: This Quick Start Guide provides an overview on how to boot the Debian image for the VIA AI Transforma Model 1 board and configure the supported hardware functions in the build.

1.2 Version Information and Supported Features

- Linux Kernel version: 5.15.47
- Linux Image: Debian 12
- Supports booting from eMMC
- Supports HDMI 4K display and audio outputs
- Supports MIPI DSI capacitive touch panels, verified with the following hardware:
 - WaveShare 7inch DSI LCD (800 x 480)
- Supports debugging through a debug console
- Supports 10/100/1000 Mbps 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 MIPI CSI
 - Raspberry Pi Camera Module 3
 - Raspberry Pi Camera Module 2
- Supports MediaTek NeuroPilot APU hardware acceleration

2. Image Installation

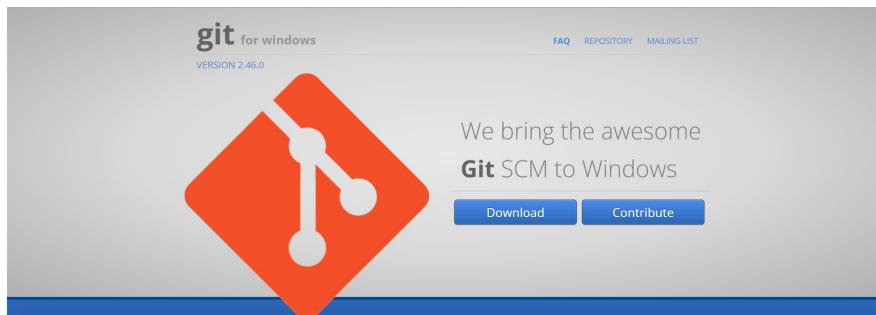
This section lists the setup requirements for installing the Debian image on VIA AI Transforma Model 1 board. The precompiled image is provided in the "Firmware" folder.

2.1 Installing the Debian 12 OS Image

Follow the steps below to install the Debian image:

Step 1: Setup Git

Visit <https://gitforwindows.org/> to download and install git for Windows.



After installation, open the git bash program and execute the following configuration commands:

```
git config --global http.sslBackend schannel
git config --global credential.helper manager-core
```

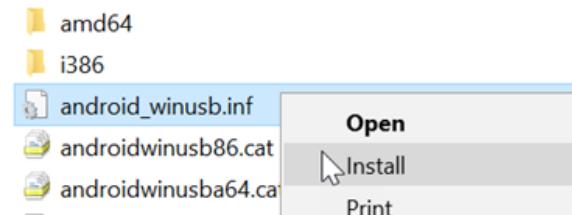
Step 2: Setup Google USB Driver & 3rd Party Fastboot Driver

The Google USB Driver contains the required device drivers for fastboot on Windows. Genio Tools require the fastboot device driver to be properly installed. To install the driver:

- Download the Google USB Driver from: <https://developer.android.com/studio/run/win-usb>
- Extract the downloaded zip file. The filename should be similar to `usb_driver_r13-windows.zip`.

In the extracted directory, locate the file "android_winusb.inf".

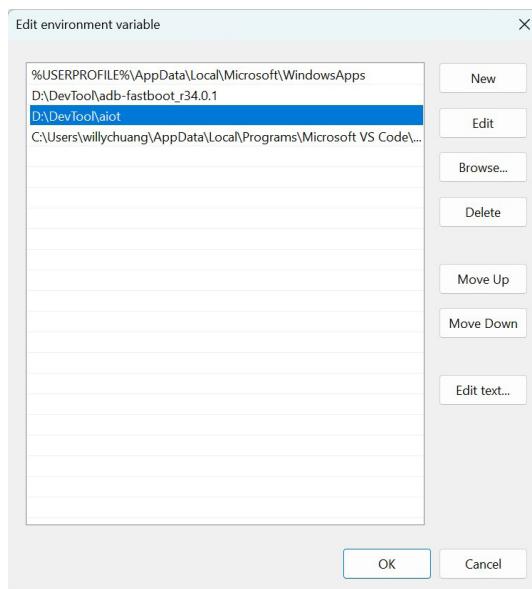
Right-click on the file "android_winusb.inf" and select "Install" from the context menu:



Step 3: Install Fastboot Tool on Windows

Download the SDK Platform-Tools for Windows from: <https://developer.android.com/tools/releases/platform-tools>.

Add the unzipped directory to PATH environment variable.



Check if it is properly installed (the version should be greater than 34.0.4) with the following command:

```
> fastboot --version
fastboot version 34.0.4-10411341
```

Step 4: Setup Python 3 on Windows

Download and install Python 3.9.x from: <https://www.python.org/downloads/> or <https://www.python.org/ftp/python/3.9.12/python-3.9.12-amd64.exe>

Make sure you've ticked the "Add Python to PATH" checkbox:



Check and make sure the version of pip3 is greater than 20.3:

```
> pip3 --version
pip 21.2.4 from c:\python39\lib\site-packages\pip (python 3.9)
```

Step 5: Install Genio Tools & FTDI Driver

Make sure the Windows PC is connected to the internet and run the following command as administrator to install Genio Tools:

```
> pip3 install -U genio-tools
Requirement already satisfied: genio-tools in c:\python39\lib\site-packages (1.4)
Collecting genio-tools
  Downloading genio_tools-1.4.1-py3-none-any.whl.metadata (889 bytes)
Requirement already satisfied: genio-bootrom in c:\python39\lib\site-packages (from genio-tools) (1.1.7)
Requirement already satisfied: gpiod==1.4.0 in c:\python39\lib\site-packages (from genio-tools) (1.4.0)
Requirement already satisfied: oyaml in c:\python39\lib\site-packages (from genio-tools) (1.0)
Requirement already satisfied: packaging in c:\python39\lib\site-packages (from genio-tools) (23.1)
Requirement already satisfied: pyftdi in c:\python39\lib\site-packages (from genio-tools) (0.55.0)
Requirement already satisfied: pyusb in c:\python39\lib\site-packages (from genio-tools) (1.2.1)
Requirement already satisfied: ftd2xx in c:\python39\lib\site-packages (from genio-tools) (1.3.3)
Requirement already satisfied: pywin32 in c:\python39\lib\site-packages (from ftd2xx->genio-tools) (306)
Requirement already satisfied: pyyaml in c:\python39\lib\site-packages (from oyaml->genio-tools) (6.0.1)
Requirement already satisfied: pyserial>=3.0 in c:\python39\lib\site-packages (from pyftdi->genio-tools) (3.5)
  Downloading genio_tools-1.4.1-py3-none-any.whl (26 kB)
Installing collected packages: genio-tools
  Attempting uninstall: genio-tools
    Found existing installation: genio-tools 1.4
    Uninstalling genio-tools-1.4:
      Successfully uninstalled genio-tools-1.4
Successfully installed genio-tools-1.4.1

[notice] A new release of pip is available: 24.1 -> 24.2
[notice] To update, run: python.exe -m pip install --upgrade pip
```

**Note:**

If you encountered installation errors such as missing **setuptools_scm**, you can install the packages first with following commands:

```
> pip3 install wheel setuptools_scm gpiod libusb1 packaging pyserial pyftdi
pyusb pyyaml pyparsing enum34 oyaml windows-curses --trusted-host pypi.org
--trusted-host pypi.python.org --trusted-host files.pythonhosted.org --trusted-
host gitlab.com
```

Check if the genio-flash tool is properly installed with the following command:

The version should be greater than 1.2

```
> genio-flash -version
1.4.1
```

You can check your installation with the following command:

```
> genio-config
fastboot: OK
```

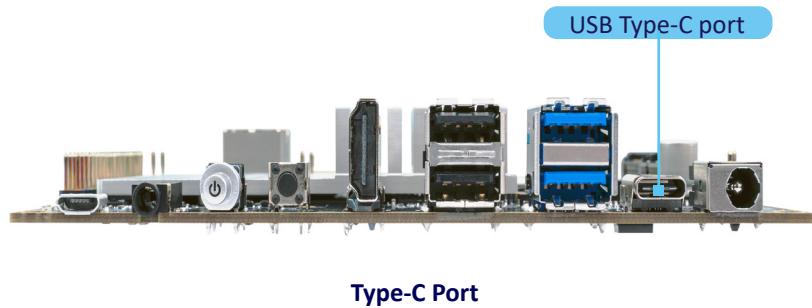
The FTDI driver is necessary for flashing the image. Please go to: D2XX Drivers - FTDI (<https://ftdichip.com/drivers/d2xx-drivers/>)

Then download the x64 driver (EX: CDM-v2.12.36.4-WHQL-Certified.zip) and install it.

After the has been driver installed, copy the files “**ftd2xx.dll**” and “**ftd2xx64.dll**” into “**C:\Windows\System32**”.

Step 6

Connect the VIA AI Transforma Model 1 board to Windows host machine through the board's USB Type-C port using a USB Type-C cable.



Unzip and extract the Debian image package "VIA_AI_Transforma_Model_1_Debian_12_OS.zip" on a Windows host machine.

Step 7

Open a CMD line terminal on the Windows host machine and execute the following commands to flash the board.

```
>      cd PATH_to_the_Package
>      genio-flash
Genio Tools: v1.4.1
Yocto Image:
      name:      Debian GNU/Linux 12 (bookworm) (debian-12.5.0)
      distro:    debian 12.5 (debian)
      codename: None
      machine:  transforma
      overlays: ['apusys.dtbo', 'video.dtbo', 'gpu-mali.dtbo']

WARNING:aiot:Cannot find any FTDI device
WARNING:aiot:Unable to find and reset the board. Possible causes are:
1. This is not a Genio 350/700 EVK, nor a Pumpkin board.
2. The board port UART0 is not connected.
3. The UART0 port is being opened by another tool, such as TeraTerm on Windows.
You can now manually reset the board into DOWNLOAD mode.

INFO:aiot:Continue flashing...
Looking for MediaTek SoC matching USB device 0e8d:0003
```

Step 8

When you see "Looking for MediaTek SoC...", hold down the Software Upgrade button and plug in the AC-to-DC power adapter to automatically power on the board. After the VIA AI Transforma Model 1 board is detected, the flashing process will begin. Continue holding down the Software Upgrade button.



Software Upgrade Button

Step 9

Messages will be printed on the PC debug console to show the flashing progress. Release the Software Upgrade button when you see the first "**OKAY**" message.

```
>      cd PATH_to_the_Package
>      genio-flash
Genio Tools: v1.4.1
Yocto Image:
  name:    Debian GNU/Linux 12 (bookworm) (debian-12.5.0)
  distro:  debian 12.5 (debian)
  codename: None
  machine: transforma
  overlays: ['video.dtbo', 'gpu-mali.dtbo', 'apusys.dtbo']

WARNING:aiot:Cannot find any FTDI device
WARNING:aiot:Unable to find and reset the board. Possible causes are:
1. This is not a Genio 350/700 EVK, nor a Pumpkin board.
2. The board port UART0 is not connected.
3. The UART0 port is being opened by another tool, such as TeraTerm on Windows.
You can now manually reset the board into DOWNLOAD mode.

INFO:aiot:Continue flashing...
Looking for MediaTek SoC matching USB device 0e8d:0003
Opening COM9 using baudrate=115200
Connected to MediaTek SoC: hw_code[0x8188]
Sending bootstrap to address: 0x201000
Jumping to bootstrap at address 0x201000 in AArch64 mode
erasing mmc0
Erasing 'mmc0'                                (bootloader) request sz: 0x3a3e00000,
real erase len: 0x0
OKAY [ 1.508s]
Finished. Total time: 1.518s
erasing mmc0boot0
Erasing 'mmc0boot0'                            (bootloader) request sz: 0x1fe0000, real
erase len: 0x1fe0000
OKAY [ 0.000s]
Finished. Total time: 0.013s
erasing mmc0boot1
Erasing 'mmc0boot1'                            (bootloader) request sz: 0x1fe0000, real
erase len: 0x1fe0000
OKAY [ 0.000s]
Finished. Total time: 0.009s
```

Step 10

Once the flashing process has completed, unplug the USB Type-C cable and the VIA AI Transforma Model 1 board will automatically reboot.

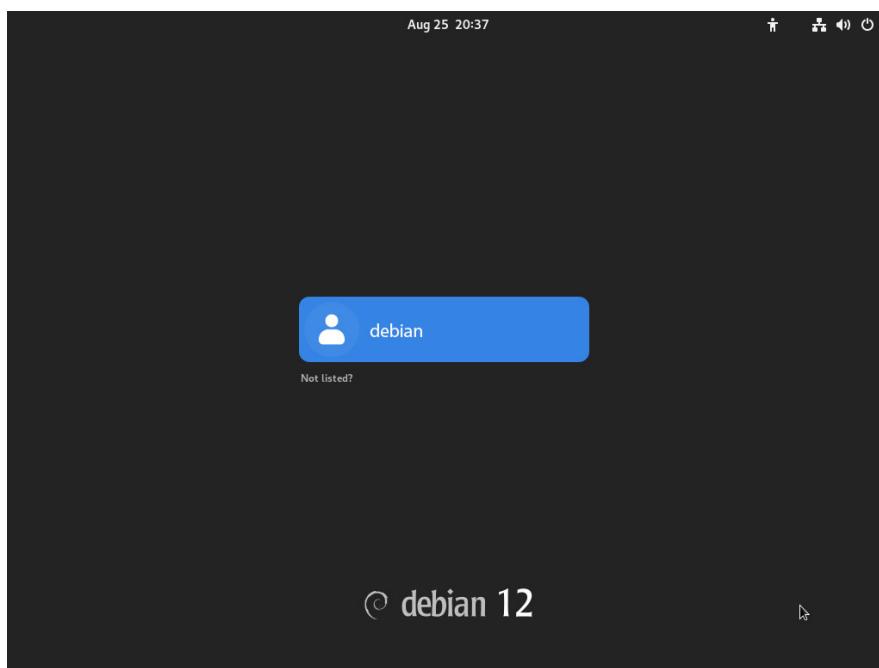
3. Debian 12 Setup

This section explains how to setup the Debian 12 OS and start to use it.

For further details about how to use Debian, you can check here: <https://www.debian.org/doc/user-manuals>.

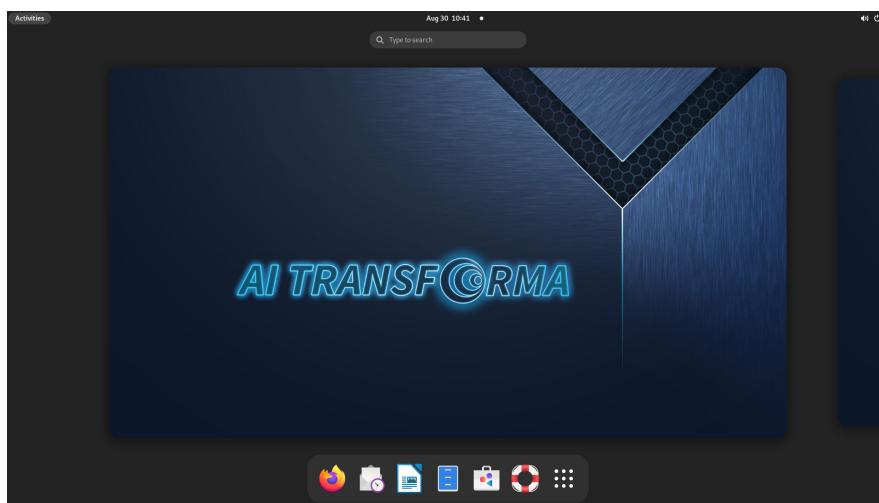
3.1 Desktop Login

Plug a keyboard and a mouse to the system and connect an HDMI monitor. Power on the system and after it finishes booting you will see the login screen:



There is no password required, just click the button to log in to the system.

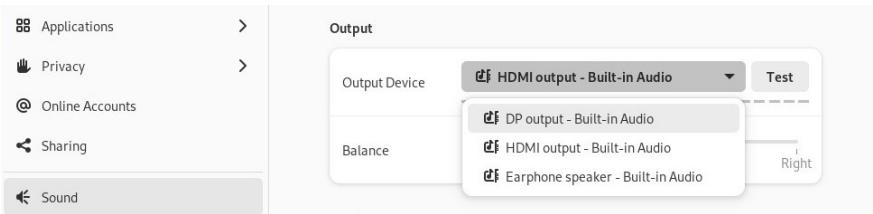
After entering the system, the desktop will be shown. Users can begin to use the provided applications or add more as required.



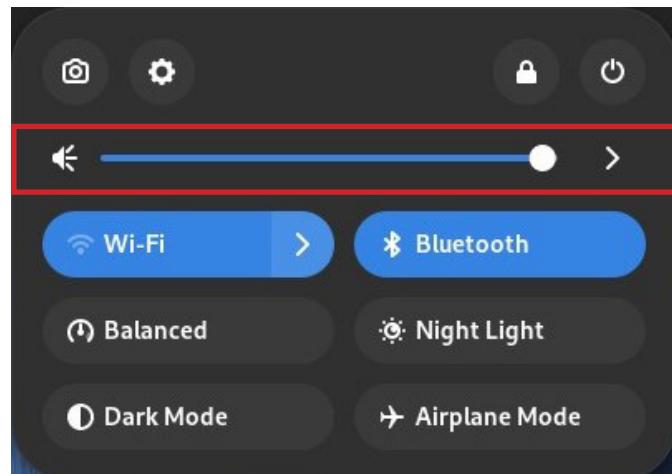
3.2 Audio Output and Recording Functions

There are three audio output paths HDMI, DP, or earphone available on the VIA AI Transforma Model 1 board.

- To test the HDMI audio output, connect an HDMI display to the VIA AI Transforma Model 1 board and set the display mode to HDMI. Go to **Settings** → **Sound** → **Output Device** and choose “**HDMI output – Built-in Audio**”. Click the “**Test**” button on the right to test.



- To test the DP audio output, connect a DP display to the VIA AI Transforma Model 1 board and set the display mode that to DP. Go to **Settings** → **Sound** → **Output Device** and choose “**DP output – Built-in Audio**”. Click the “**Test**” button on the right to test.
- To test the earphone output, connect a 3.5mm earphone to the VIA AI Transforma Model 1 board. Go to **Settings** → **Sound** → **Output Device**. Choose “**Earphone speaker – Built-in Audio**”. Click the “**Test**” button on the right to test.
- To adjust the audio output volume, adjust the scroll bar.

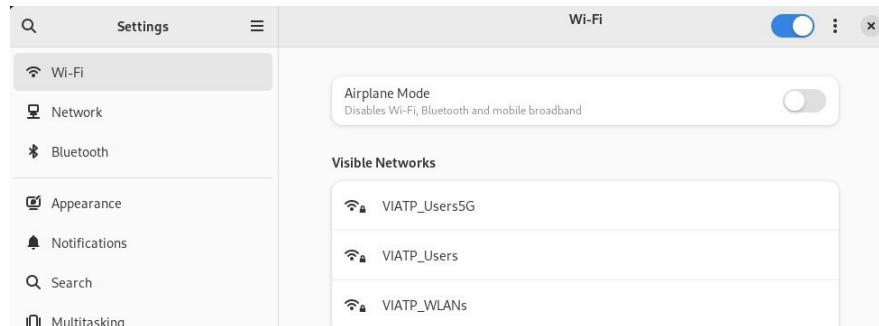


- To record audio from a microphone, connect a headset with a built-in microphone to the VIA AI Transforma Model 1 board. Go to **Settings** → **Sound** → **Input Device** and choose “**Headphone with Mic**” to test it.



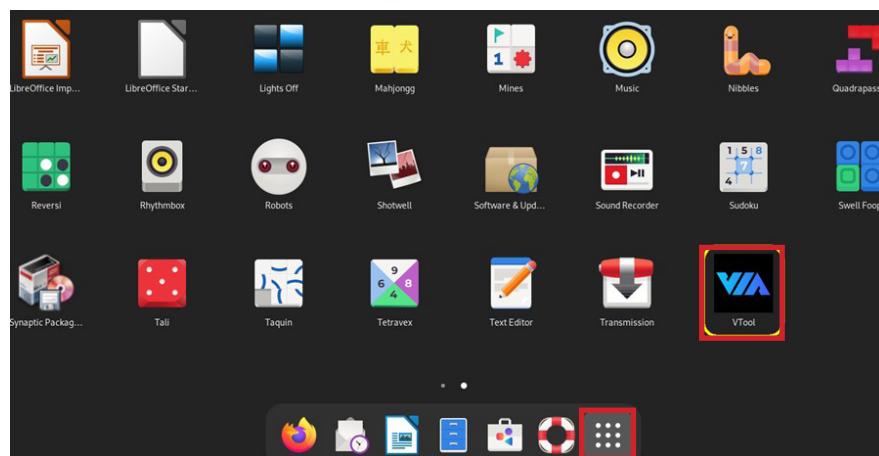
3.3 Wi-Fi Setup

To connect to a Wi-Fi hotspot, go to **Settings** → **Wi-Fi** and choose a Wi-Fi network to connect to. Make sure the Wi-Fi antennas have been connected to the Wi-Fi/BT module correctly.

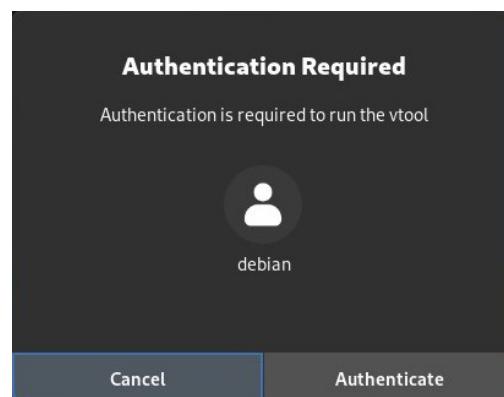


3.4 VTool Utility

Included in the Debian 12 OS image is a utility developed by VIA called "VTool". The VTool utility allows users to quickly change the display and 40-pin header settings. It can be found with the other applications installed on the board as shown below:

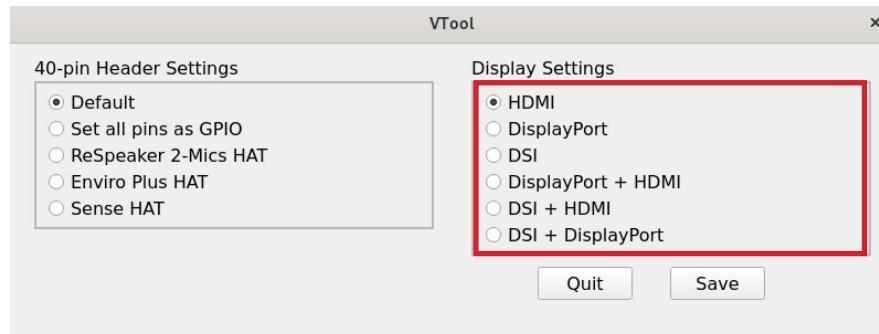


To launch the VTool utility, double click on the "VTool" icon and then click on "Authenticate" button.



3.4.1 Display Settings

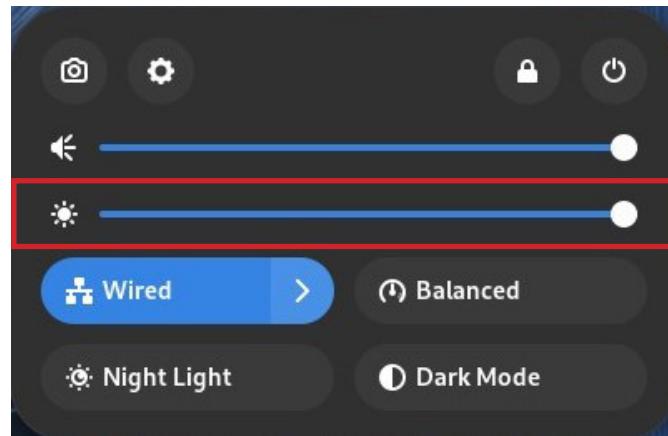
After launching the VTool application, select the desired display setting on the righthand side of the pop-up window and save the configuration.



In order to apply the new configuration, click on the "reboot" button. If you select "Ignore" the changes will take place on the next system boot.



If you are using a DSI display, you can use the standard system settings to adjust the DSI LCD panel's backlight.



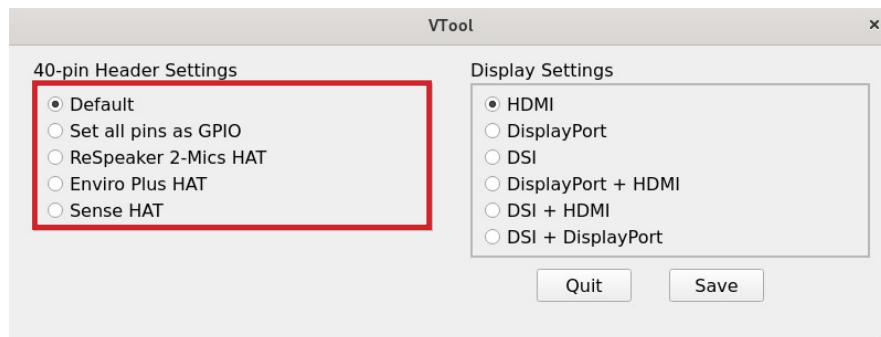
3.4.2 40-Pin Header Settings

After launching the VTool application, the lefthand side of the pop-up window provides some simple configuration options for the 40-pin header settings.

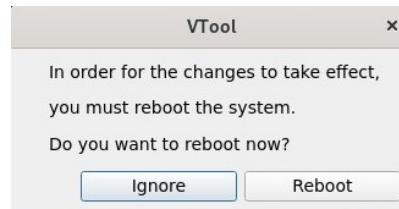
- **Default** - sets the default GPIO settings as defined in the VIA AI Transforma Model 1 User Manual.
- **Set all pins as GPIO** - will change all available pins to behave as GPIO.
- **ReSpeaker 2-Mics HAT** - will change the pin definition to match the requirements for the ReSpeaker 2-Mics HAT to function on the VIA AI Transforma Model 1 board.
- **Enviro Plus HAT** - will change the pin definition to match the requirements for the Enviro Plus HAT to function on the VIA AI Transforma Model 1 board.
- **Sense HAT** - will change the pin definition to match the requirements for the Sense HAT to function on the VIA AI Transforma Model 1 board.

**Note:**

If you are using one of the supported HAT options, refer to the corresponding Quick Start guide for detailed support information.



In order to apply the new configuration, click on the "reboot" button. If you select "Ignore" the changes will take place on the next system boot.



3.5 GPU Hardware Acceleration Benchmark

Open a terminal window and use the following command to run the preinstalled OpenGL (ES) 2.0 benchmarking tool to check the GPU performance.

```
debian@transofrma:~$ glmark2-es2-wayland
```



Here is a sample test result:

```
debian@transofrma:~$ glmark2-es2-wayland -s 1920x1080
=====
glamrk 2023.01
=====
  GL_VENDOR:      ARM
  GL_RENDERER:   Mali-G57
  GL_Version:    OpenGL ES 3.2 v1.r43p0-01eac0.9a13c9e0a61440b9ccacad5d0b9560d9
  Surface Config: buf=32 r=8 g=8 a=8 depth=24 stencil=0 smaples=0
  Surface Size:  1920x1080 windowed
=====
.....
=====
          glmark2 Score: 358
=====
```

3.6 APU Hardware Acceleration Benchmark

Open a terminal window and execute the following command to run the preinstalled APU test tool:

```
debian@transofrma:~$ sudo python3 /usr/share/benchmark_dla/benchmark.py --auto
2024-01-26 22:14:10,818 [INFO] /usr/share/benchmark_dla/ResNet50V2_224_1.0_quant.tflite,
mdla3.0, avg inference time: 6.04
/usr/share/benchmark_dla/ResNet50V2_224_1.0_quant.tflite, mdla3.0, avg inference time: 6.04
2024-01-26 22:14:18,423 [INFO] /usr/share/benchmark_dla/ResNet50V2_224_1.0_quant.tflite, vpu,
avg inference time: 59.2
/usr/share/benchmark_dla/ResNet50V2_224_1.0_quant.tflite, vpu, avg inference time: 59.2
2024-01-26 22:14:19,095 [INFO] /usr/share/benchmark_dla/mobilenet_v2_1.0_224_quant.tflite,
mdla3.0, avg inference time: 1.04
/usr/share/benchmark_dla/mobilenet_v2_1.0_224_quant.tflite, mdla3.0, avg inference time: 1.04
2024-01-26 22:14:21,346 [INFO] /usr/share/benchmark_dla/mobilenet_v2_1.0_224_quant.tflite,
vpu, avg inference time: 16.92
/usr/share/benchmark_dla/mobilenet_v2_1.0_224_quant.tflite, vpu, avg inference time: 16.92
2024-01-26 22:14:22,253 [INFO] /usr/share/benchmark_dla/ssd_mobilenet_v1_coco_quantized.
tflite, mdla3.0, avg inference time: 2.48
/usr/share/benchmark_dla/ssd_mobilenet_v1_coco_quantized.tflite, mdla3.0, avg inference time:
2.48
2024-01-26 22:14:25,519 [INFO] /usr/share/benchmark_dla/ssd_mobilenet_v1_coco_quantized.
```

```
tflite, vpu, avg inference time: 24.22
/usr/share/benchmark_dla/ssd_mobilenet_v1_coco_quantized.tflite, vpu, avg inference time:
24.22
2024-01-26 22:14:27,182 [INFO] /usr/share/benchmark_dla/inception_v3_quant.tflite, mdla3.0,
avg inference time: 6.77
/usr/share/benchmark_dla/inception_v3_quant.tflite, mdla3.0, avg inference time: 6.77
2024-01-26 22:14:36,160 [INFO] /usr/share/benchmark_dla/inception_v3_quant.tflite, vpu, avg
inference time: 74.25
/usr/share/benchmark_dla/inception_v3_quant.tflite, vpu, avg inference time: 74.25
```

After the tool has been executed, the inference time of each test AI model will be displayed, providing a reference about what can be done with the AI processor unit.

3.7 Debug Console

If you need a debug console environment, follow the steps below to setup the debug console:

Step 1

Connect a Windows 10 host machine and the VIA AI Transforma Model 1 board through the Micro USB debug port using a Micro USB cable.



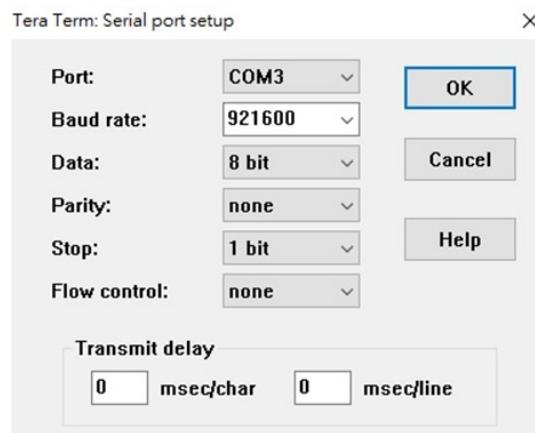
Micro USB Port

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 AI Transforma Model 1 board to initiate the boot process.

Step 5

When the VIA AI Transforma Model 1 board has completed booting, log in to the debug console. The default username is "debian" and no password is required.



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