USER MANUAL

VIA AI Transforma Model 1

Fanless low-power platform for Edge AI applications with MediaTek Genio 700 Octa-Core processor

1.01-17102024

Regulatory Compliance

FCC-A Radio Frequency Interference Statement

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 commercial environment. 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. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his personal expense.

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.

Notice 2

Shielded interface cables and A.C. power cord, if any, must be used in order to comply with the emission limits.

Notice 3

The product described in this document is designed for general use, VIA Technologies assumes no responsibility for the conflicts or damages arising from incompatibility of the product. Check compatibility issue with your local sales representatives before placing an order.

Battery Recycling and Disposal

- Only use the appropriate battery specified for this product.
- Do not re-use, recharge, or reheat an old battery.
- Do not attempt to force open the battery.
- Do not discard used batteries with regular trash.
- Discard used batteries according to local regulations.

Safety Precautions

- Always read the safety instructions carefully.
- Keep this User's Manual for future reference.
- All cautions and warnings on the board should be noted.
- Keep the board away from humidity.
- Put the board on a reliable flat surface before setting it up.
- Check the voltage of the power source and adjust to 110/220V before connecting the board to the power inlet.
- Do not place the power cord where people will step on it.
- Always unplug the power cord before plugging in an add-on card or board.
- If any of the following situations arise, get the board checked by authorized service personnel:
  - The power cord or plug is damaged.
  - Liquid has entered into the board.
  - The board has been exposed to moisture.
  - The board is faulty or you cannot get it work according to User's Manual.
  - The board has been dropped and damaged.
  - The board has an obvious sign of breakage.
- Do not leave the board in extreme temperatures or in a storage temperature above 60°C (140°F). The board may be damaged.
- Do not leave the board in direct sunlight.
- Never pour any liquid on the board or into any port. Liquid can cause damage or electrical shock.
- Do not place anything over the power cord.

Packing List

- VIA AI Transforma Model 1 board with heatsink
- 4 plastic spacers
- 5V 8A AC-to-DC power adapter and cable for US and EU

Ordering Information

Part Number	SoC Frequency	Description
10GRK22S000A0	MediaTek Genio 700 Octa-Core SoC @ 2.2GHz/2.0GHz	AI Transforma Model 1 board with 2.2GHz/2.0GHz MediaTek Genio 700 Octa-Core SoC, 16GB eMMC, 8GB LPDDR4X SDRAM, MIPI DSI, MIPI CSI, HDMI, 2 USB 3.1 Type-A, USB 3.1 Gen 1, 2 USB 2.0, Micro USB for debugging, Gigabit Ethernet, 40-pin GPIO, Audio Jack, 2 M.2 slots, MicroSD card slot, Nano SIM card slot, 5V DC-in

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1. Product Overview

Introducing the **VIA AI Transforma Model 1**, a powerful and versatile solution designed for a wide range of applications. This AI board is equipped with cutting-edge technology to meet the demands of modern computing and AI processing.

Driven by the MediaTek Genio 700 platform, the VIA AI Transforma Model 1 board is equipped with two "big core" ARM Cortex-A78 and six "efficiency core" Cortex-A55 CPUs, 8GB of LPDDR4X system memory, and a highly efficient integrated AI processor that supports up to 4 TOPS. Armed with powerful and futuristic AI, graphics and high-quality audio processing capabilities, the VIA AI Transforma Model 1 board provides a high performance, flexible, and robust platform for fast prototyping the most demanding of AI, IoT, or multimedia applications.

With dimensions of only 14.6cm x 10.2cm, the VIA AI Transforma Model 1 board packs in extensive I/O and network connectivity options into a small form factor, including 4-lane MIPI DSI and CSI connectors, HDMI, USB 3.1, Gigabit Ethernet, a 40-pin GPIO header to connect many Raspberry Pi supported HATs, cameras, displays, as well as to allow expansion for custom hardware like LEDs, actuators, motors, sensors, and buttons. A MicroSD card slot, two onboard M.2 slots and a Nano SIM card slot provide additional expansion opportunities for integrating Wi-Fi and 4G/5G connectivity, increased storage, NPU accelerators and other PCIe devices. Onboard storage is provided by 16GB of eMMC 5.1 flash memory.

To boost AI application development, the VIA AI Transforma Model 1 board comes with a Linux BSP that supports the Debian 12 operating system.

1.1 Key Features

- High performance and power-efficient MediaTek Genio 700 Octa-Core processor
- Integrated AI processor featuring MediaTek Deep Learning Accelerator (MDLA) 3.0 and Cadence® Tensilica® Vision P6 NPU supporting up to 4 TOPS
- 8GB system memory and 16GB onboard eMMC storage
- High-quality audio and hardware accelerated H.265/H.264 4K video encoding and decoding
- Advanced power management and surge protection
- HDMI, MIPI DSI and MIPI CSI display and camera support
- 40-pin GPIO header to connect Raspberry Pi supported HATs, cameras, displays, LEDs, actuators, motors, sensors, and buttons
- Gigabit Ethernet
- MicroSD card, M.2 and Nano SIM card slots for optional Wi-Fi, 4G/5G, increased storage, NPU accelerators and other PCIe devices
- Support for Debian 12 operating system

1.2 Product Specifications

Processor

- MediaTek Genio 700 Octa-Core
  - Two Cortex-A78 cores @ 2.2GHz
  - Six Cortex-A55 cores @ 2.0GHz

System Memory

- 8GB LPDDR4X SDRAM

Storage

- 16GB eMMC flash memory

Graphics

- ARM Mali-G57 MC3 High Performance GPU
- Graphics engine supporting OpenGL® ES 1.1/2.0/3.2, OpenCL ES 2.2, and Vulkan 1.0/1.1 hardware acceleration
- Supports H.265 and H.264 video decoding up to 4K@75fps and video encoding up to 4K@30fps

AI Processor

- MediaTek Deep Learning Accelerator (MDLA) 3.0 and Cadence® Tensilica® Vision P6 NPU (supports up to 4 TOPS)

Audio DSP

- Cadence® Tensilica® HiFi 5

Ethernet

- Realtek RTL8211F(I)-CG Gigabit Ethernet Transceiver

PMIC

- MediaTek MT6365 (with Audio Codec)
- MediaTek MT6319

Video

- Integrated HDMI 2.0b and DisplayPort 1.4 Transmitters

USB

- VL817-Q7 (C0) USB3.1 Hub Controller
- VL211-Q4 (A0) SuperSpeed USB 5Gbps Hub Controller

MCU

- Integrated to support Watchdog and RTC functions

Onboard I/O

- 1 x 4-lane MIPI DSI connector
- 1 x 4-lane MIPI CSI connector
- 1 x 40-pin GPIO header (supports GPIO, SPI, I2C, UART TX/RX, 5V power input, 5V/3.3V power output, GND, PWM and PCM)
- 2 x M.2 slots
- 1 x Nano SIM card slot
- 1 x 2-pin RTC battery connector
- 1 x 3-pin Auto power ON pin header
- 1 x 2-pin Watchdog pin header

Front I/O

- 1 x HDMI port
- 2 x USB 2.0 ports
- 2 x USB 3.1 Type A ports
- 1 x USB 3.1 Gen 1 port (supports maximum 15W output, OTG and DisplayPort Alt mode)
- 1 x Micro USB port for debugging
- 1 x 3.5mm audio jack (supports line-out and MIC-in)
- 1 x Power-ON button with LED
- 1 x Software upgrade button
- 1 x 5V DC-in power connector

Back I/O

- 1 x Gigabit Ethernet port
- 1 x MicroSD Card slot

Power Supply

- 1 x 5V DC-in

Operating System

- Debian 12

Operating Temperature

- 0°C ~ 60°C

Operating Humidity

- 0% ~ 95% (relative humidity ; non-condensing)

Form Factor

- 14.6cm x 10.2cm (5.75" x 4.02")

Compliance

- CE, FCC, BSMI, UKCA

Notes:

1. As the operating temperature provided in the specifications is a result of testing performed in a testing chamber, a number of variables can influence this result. Please note that the working temperature may vary depending on the actual situation and environment. It is highly recommended to execute a solid testing program and take all variables into consideration when building the system. Please ensure that the system is stable under the required operating temperature in terms of the target application.

2. Please note that the lifespan of the onboard eMMC memory chip may vary depending on the amount of access. More frequent and larger data access on the eMMC memory will shorten its lifespan. It is highly recommended to use a replaceable external storage (e.g., MicroSD card) for large data access.

1.3 Layout Diagram

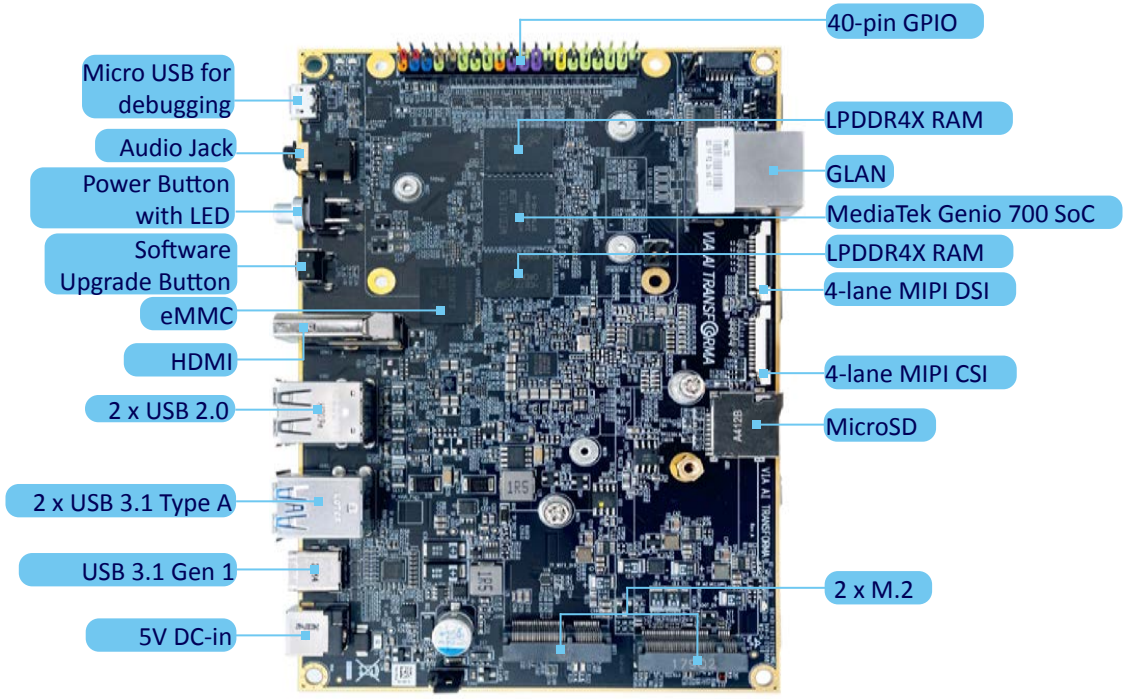

Figure 01: VIA AI Transforma Model 1 board top I/O

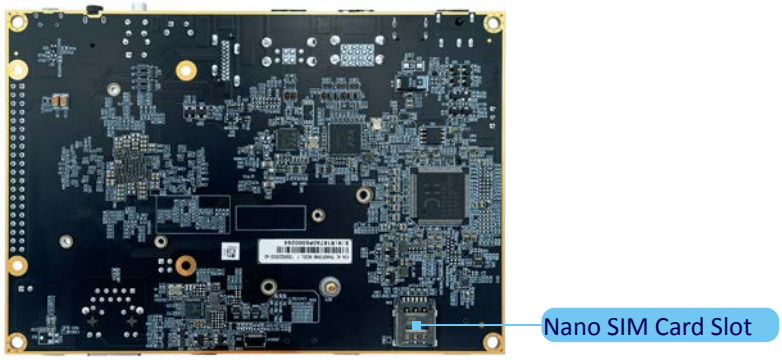

Figure 02: VIA AI Transforma Model 1 board bottom I/O

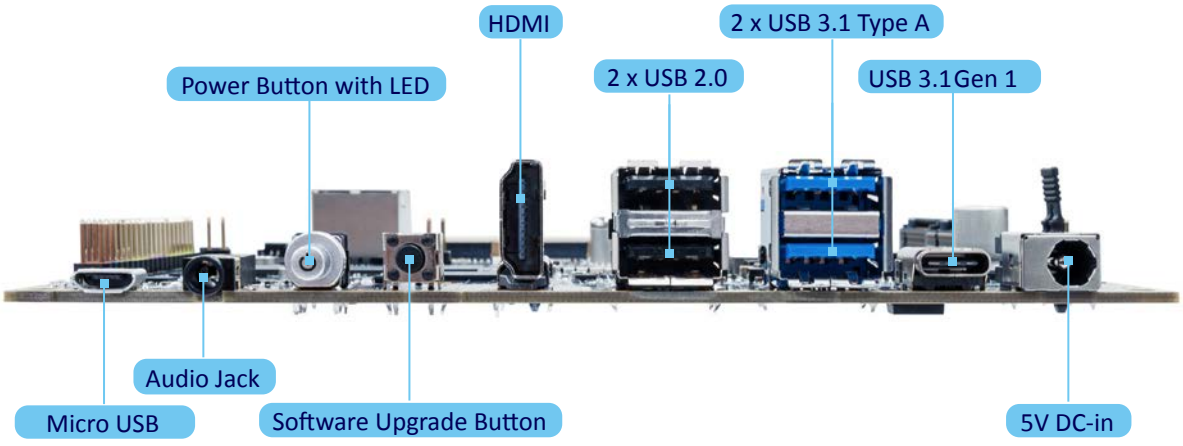

Figure 03: VIA AI Transforma Model 1 board front coastline I/O

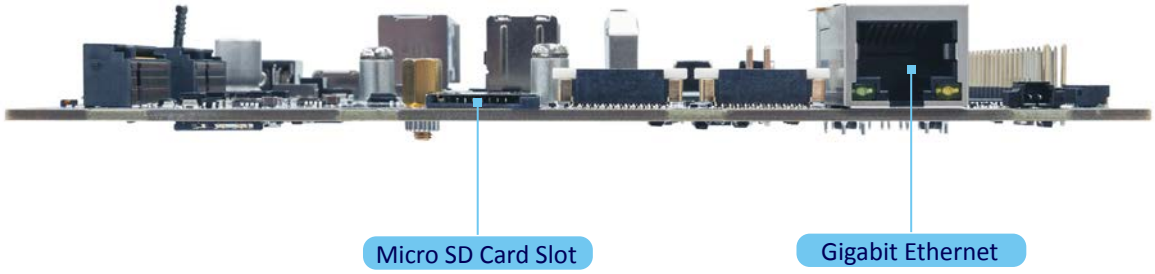

Figure 04: VIA AI Transforma Model 1 board back coastline I/O

1.4 Product Dimensions

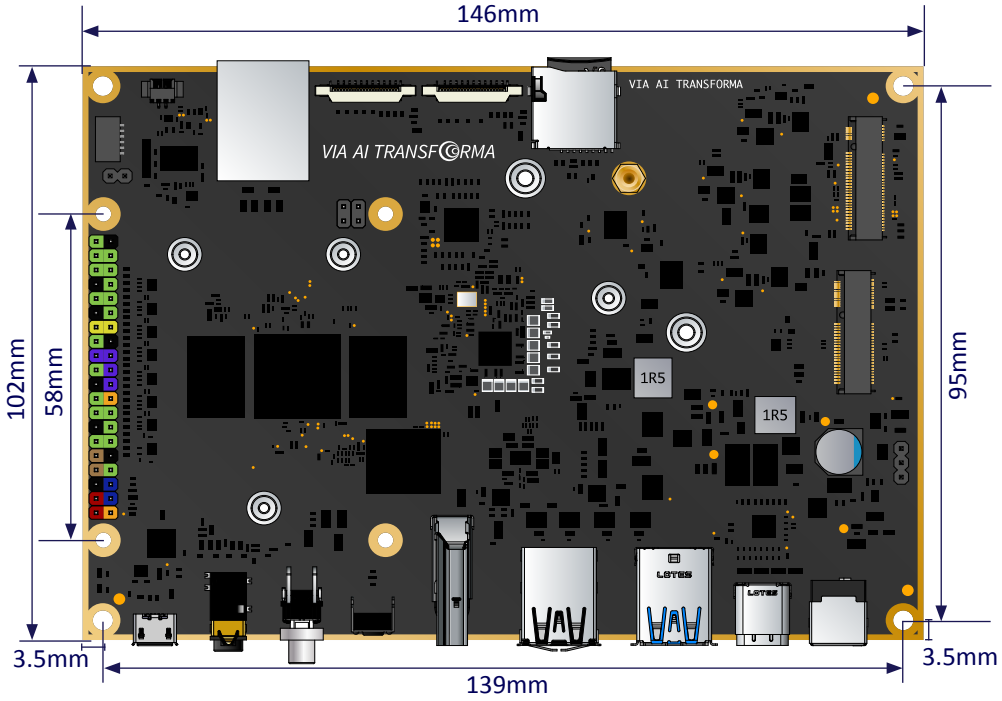

Figure 05: Dimensions of the VIA AI Transforma Model 1 board (top I/O)

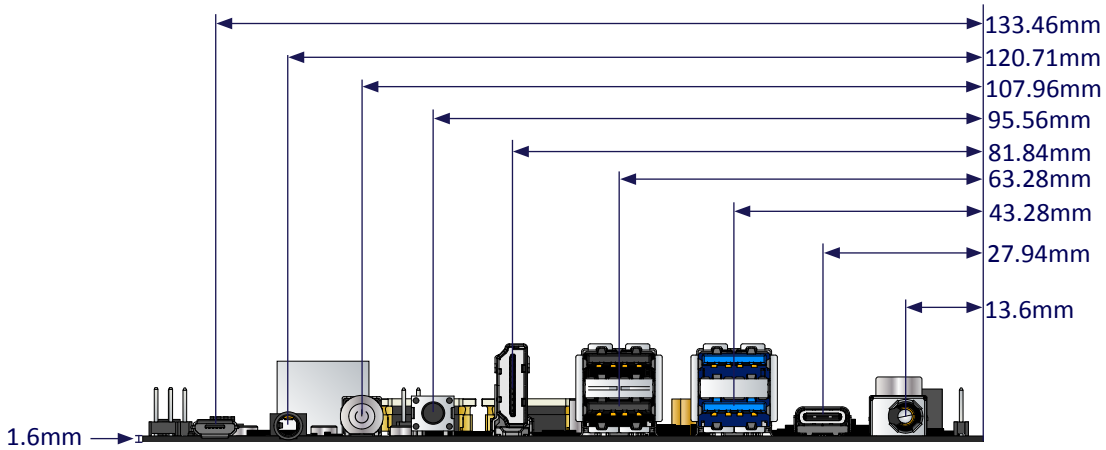

Figure 06: External I/O dimensions of the VIA AI Transforma Model 1 board (front coastline I/O)

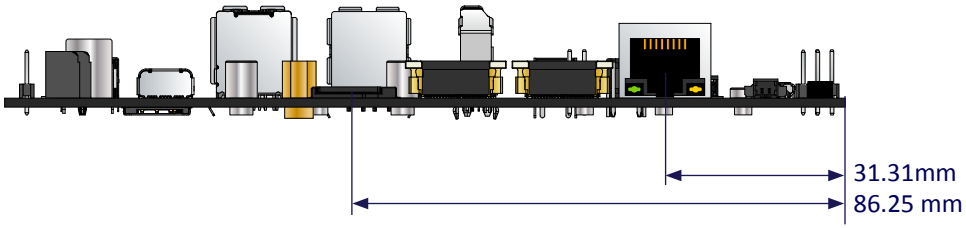

Figure 07: External I/O dimensions of the VIA AI Transforma Model 1 board (back coastline I/O)

1.5 I/O Spacing

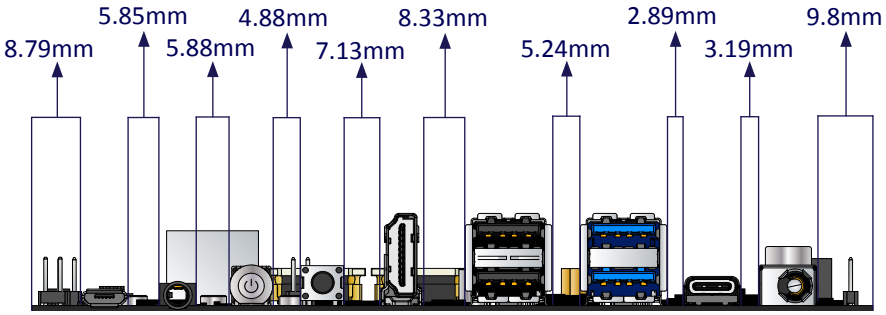

Figure 08: I/O spacing of the VIA AI Transforma Model 1 board (front coastline I/O)

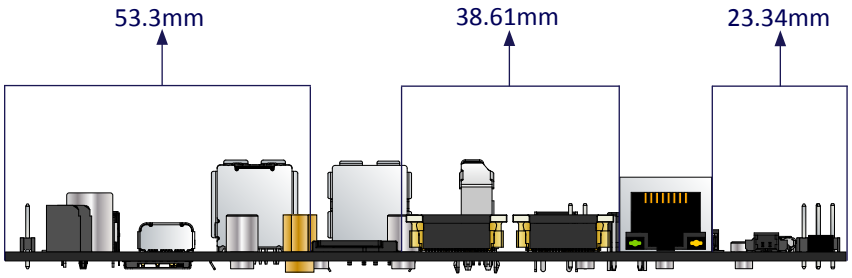

Figure 09: I/O spacing of the VIA AI Transforma Model 1 board (back coastline I/O)

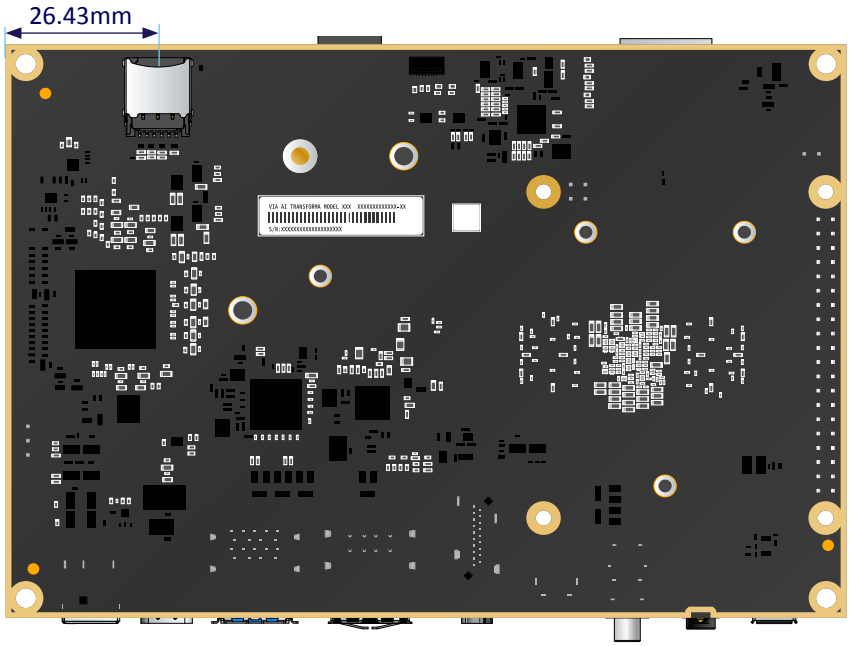

Figure 10: I/O spacing of the VIA AI Transforma Model 1 board (bottom I/O)

1.6 Height Distribution

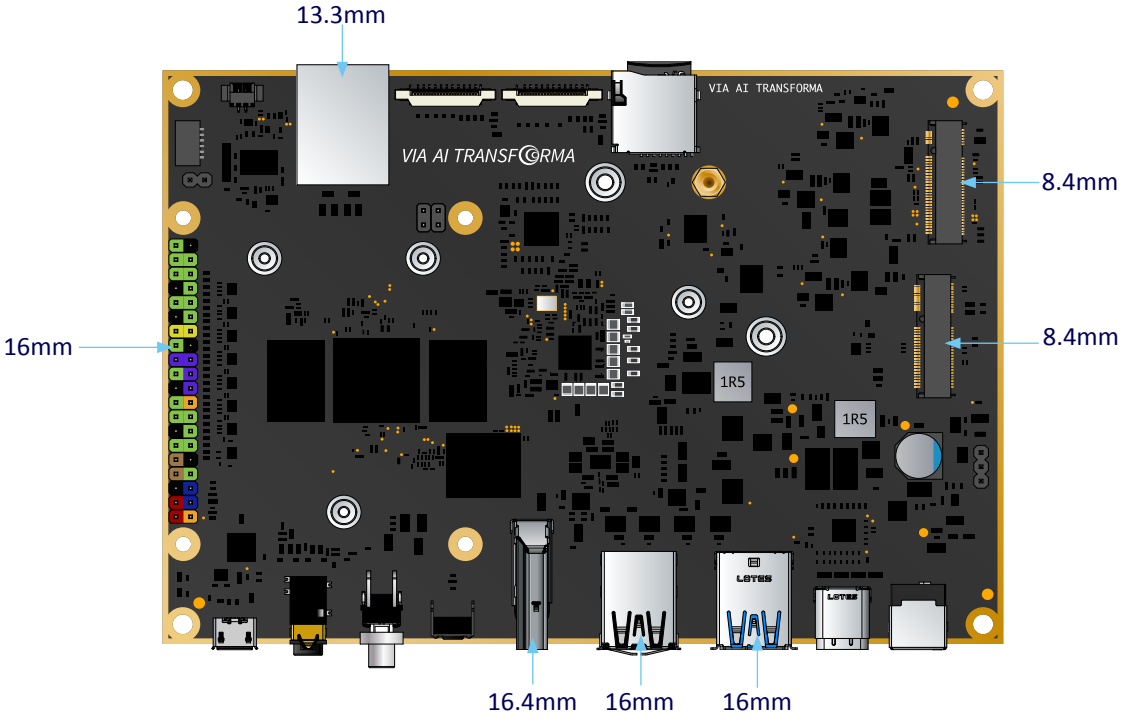

Figure 11: Height distribution of the VIA AI Transforma Model 1 board (top I/O)

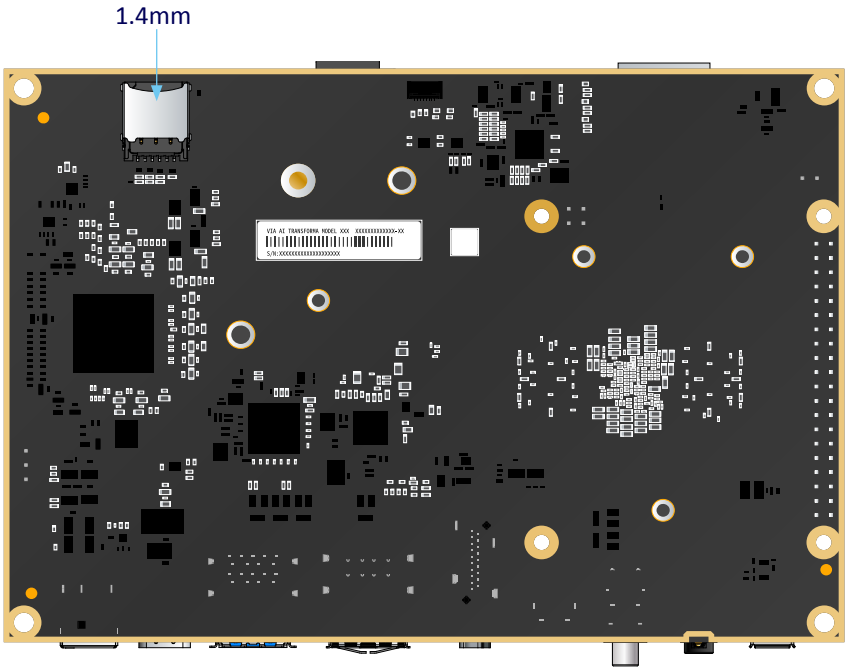

Figure 12: Height distribution of the VIA AI Transforma Model 1 board (bottom I/O)

1.7 M.2 Slots and Standoffs Dimensions

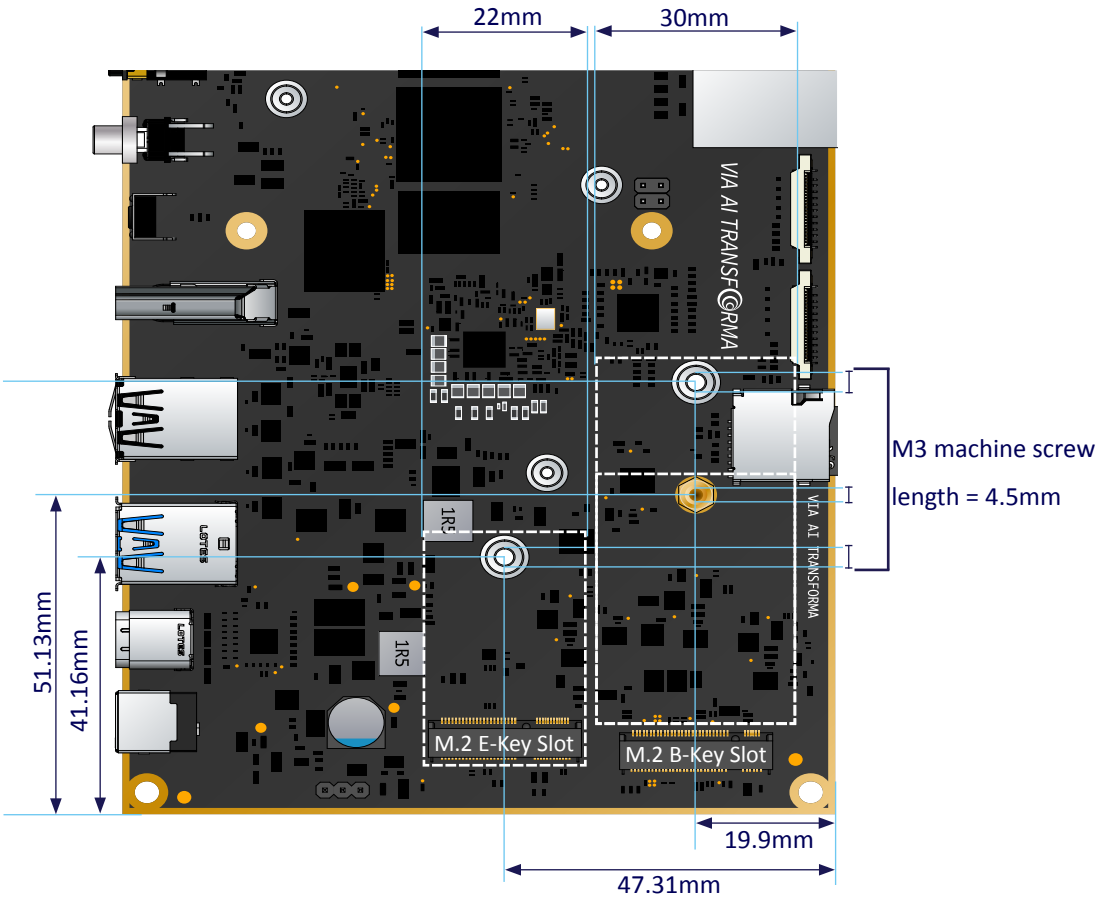

Figure 13: M.2 slots and standoffs dimensions

2. On-Board I/O Pin Descriptions and Functionality

This chapter provides information about the onboard I/O connectors and pin headers of the VIA AI Transforma Model 1 board.

2.1 40-pin GPIO Header

The VIA AI Transforma Model 1 board comes with a 40-pin Raspberry Pi-type GPIO header labeled as 'J6', which can be used for connecting I2C, SPI, UART TX/RX, 5V power input, 5V/3.3V power output, GND, PWM, PCM, and 13 I/O expander GPIO devices such as Raspberry Pi supported HATs, cameras, displays, LEDs, actuators, motors, sensors, and buttons. The pinouts of the 40-pin GPIO header are shown below.

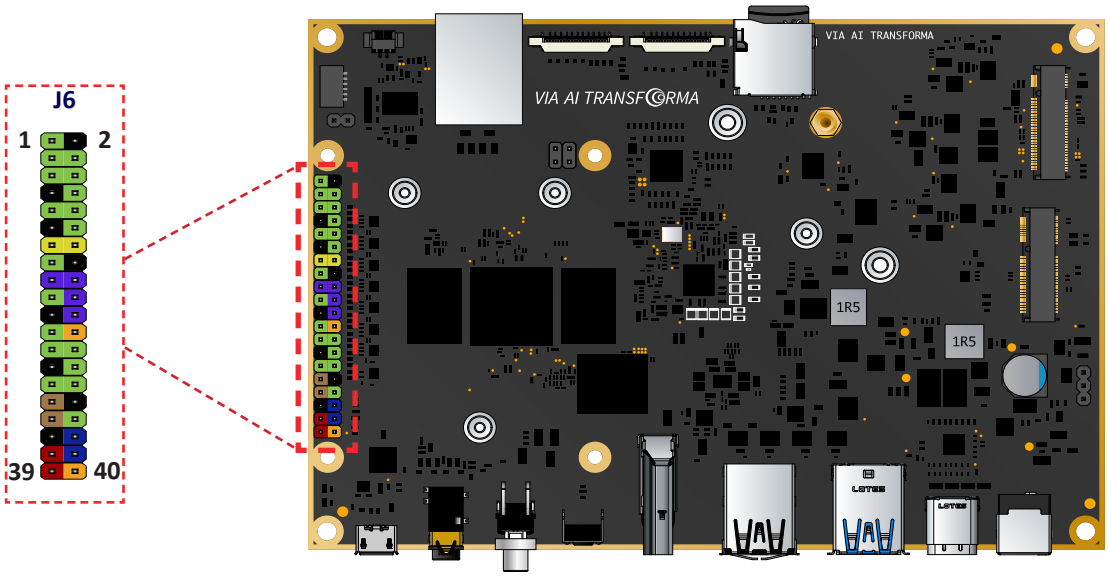

Figure 14: 40-pin Raspberry Pi-type GPIO header 'J6'

J6							
Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	3V3_RP1	2	5V_RPI	21	SPI_MI	22	GPIO38
3	SDA2	4	5V_RPI	23	SPI_CLK	24	SPI_CS
5	SCL2	6	GND	25	GND	26	GPIO90
7	GPIO39	8	UART_TXD	27	SDA0	28	SCL0
9	GND	10	UART_RXD	29	GPIO01	30	GND
11	GPIO00	12	PCM_CK	31	GPIO112	32	GPIO28
13	GPIO37	14	GND	33	PWM1	34	GND
15	GPIO41	16	GPIO75	35	PCM_SY	36	GPIO76
17	3V3_RP1	18	GPIO40	37	GPIO111	38	PCM_DI
19	SPI_MO	20	GND	39	GND	40	PCM_DO

Table 01: 40-pin Raspberry Pi-type GPIO header 'J6' pinouts

2.2 M.2 Slots

The VIA AI Transforma Model 1 board is equipped with a standard M.2 format 3042 key B slot labeled 'MB2' and a standard M.2 format 3042 key E slot labeled 'JWIFI', which can be used for adding Wi-Fi and 4G/5G connectivity, increased storage, NPU accelerators or other PCIe devices.

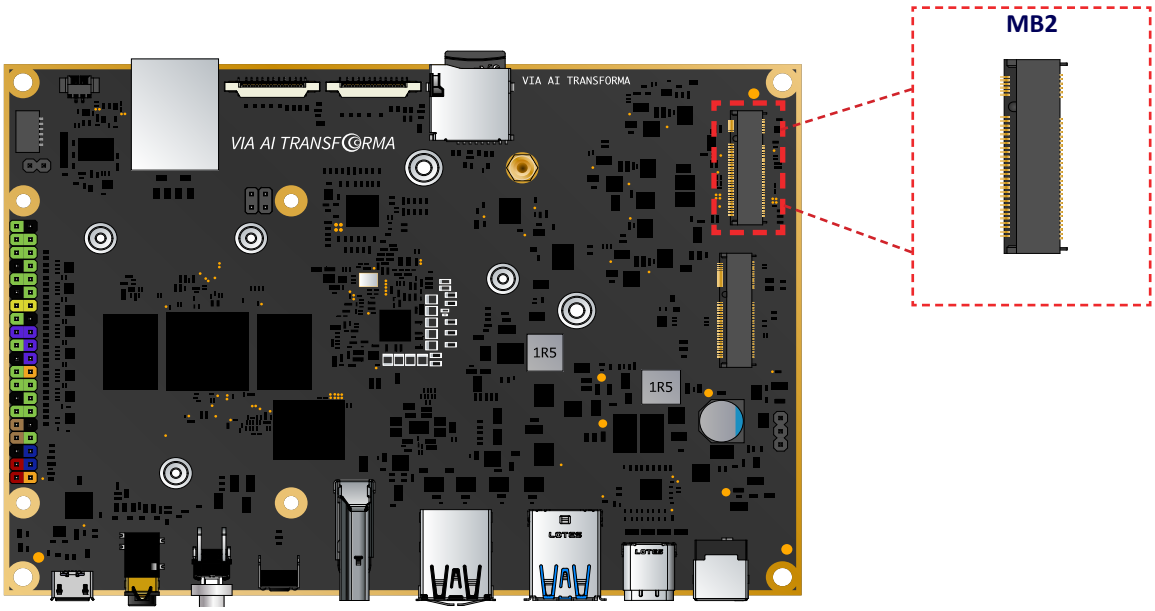

Figure 15: M.2 B-key slot 'MB2'

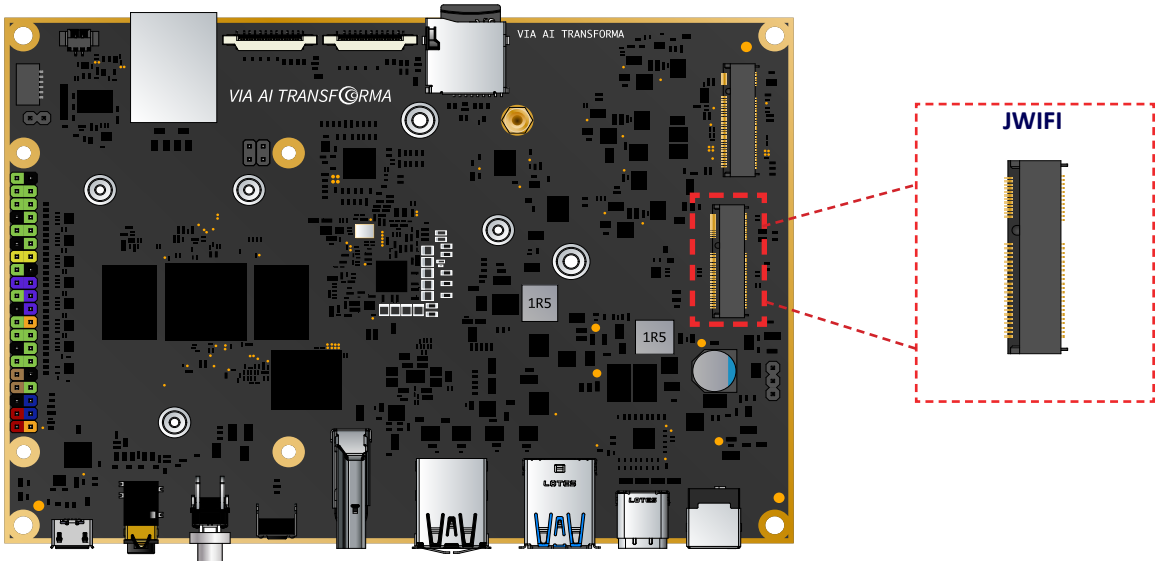

Figure 16: M.2 E-key slot 'JWIFI'

2.3 Onboard Jumpers and Headers

Jumper/Header Descriptions

A jumper or header consists of a pair of conductive pins used to close in or bypass an electronic circuit to set up or configure a particular feature using a jumper cap. The jumper cap is a small metal clip covered by plastic. It performs like a connecting bridge to short (connect) the pair of pins. The usual colors of the jumper cap are black/red/blue/white/yellow.

Jumper Setting

There are two settings of the jumper/header pins: 'Short' and 'Open'. The pins are 'Short' when a jumper cap is placed on the pair of pins. The pins are 'Open' if the jumper cap is removed.

In addition, there are jumpers/headers that have three or more pins, and some pins are arranged in series. In case of a jumper with three pins, place the jumper cap on pin 1 and pin 2 or pin 2 and 3 to short it. In case of a header with four pins, leave the pins open.

Some jumpers' sizes are small or mounted on a crowded location on the VIA AI Transforma Model 1 board that makes it difficult to access. Therefore, using a long-nose plier in installing and removing the jumper cap is very helpful.

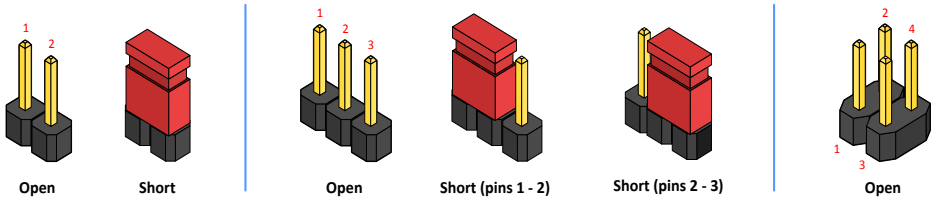

Figure 17: Jumper/header settings examples

Caution:
Make sure to install the jumper cap on the correct pins. Installing it on the wrong pins might cause damage and malfunction.

2.3.1 Watchdog Jumper

The VIA AI Transforma Model 1 board comes with a 2-pin watchdog jumper labeled as 'JWDG', which can be used for enabling/disabling the watchdog function of the VIA AI Transforma Model 1 board. The watchdog jumper settings are shown below.

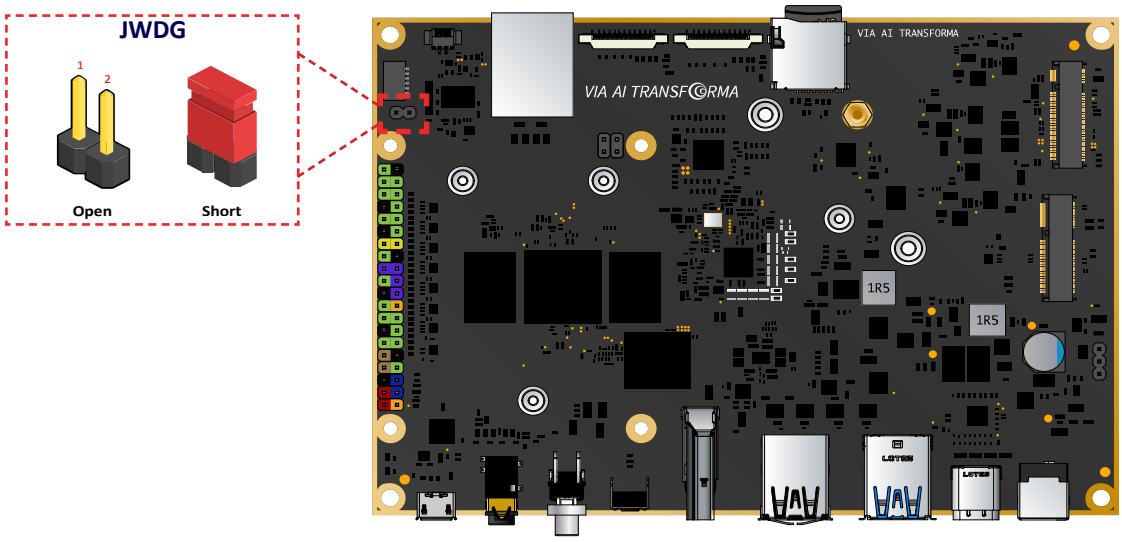

Figure 18: Watchdog jumper 'JWDG'

Pins	Signals
1	GND
2	PA4

Table 02: Watchdog jumper 'JWDG' pins and signals

Settings	Pin 1	Pin 2
Disabled (default)	Short	Short
Enabled	Open	Open

Table 03: Watchdog jumper 'JWDG' settings

2.3.2 Auto Power ON Jumper

The VIA AI Transforma Model 1 board comes with a 3-pin auto power ON jumper labeled as 'J_APO', which can be used for enabling or disabling the auto power ON function of the VIA AI Transforma Model 1 board. The auto power ON jumper settings are shown below.

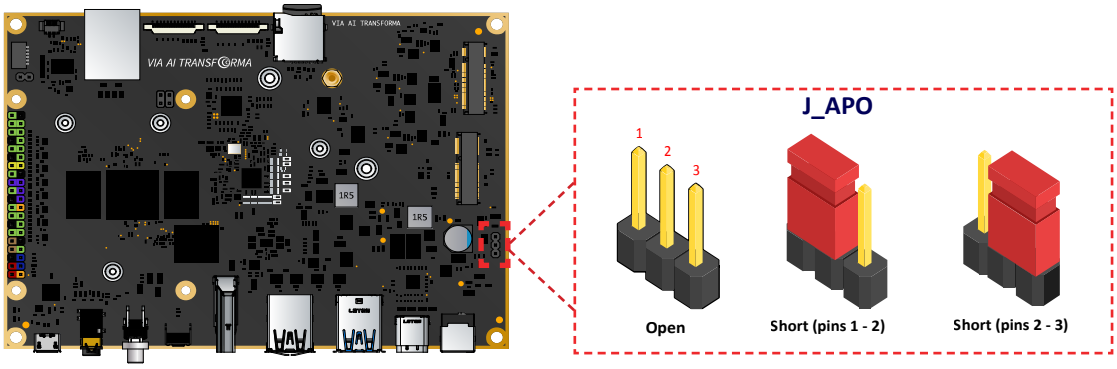

Figure 19: Auto Power ON jumper 'J_APO'

Pins	Signals
1	CHRDETB
2	VSYS
3	NC

Table 04: Auto Power ON jumper 'J_APO' pins and signals

J_APO			
Settings	**Pin 1**	**Pin 2**	**Pin 3**
Enable auto power ON	Short	Short	Open
Disable auto power ON	Open	Short	Short

Table 05: Auto power ON jumper 'J_APO' settings

2.3.3 PoE Header

The VIA AI Transforma Model 1 board comes with a 4-pin PoE header labeled as 'J19', which can be used for connecting to Raspberry Pi HATs for implementing Power-over-Ethernet. The PoE header's pins and signals are shown below.

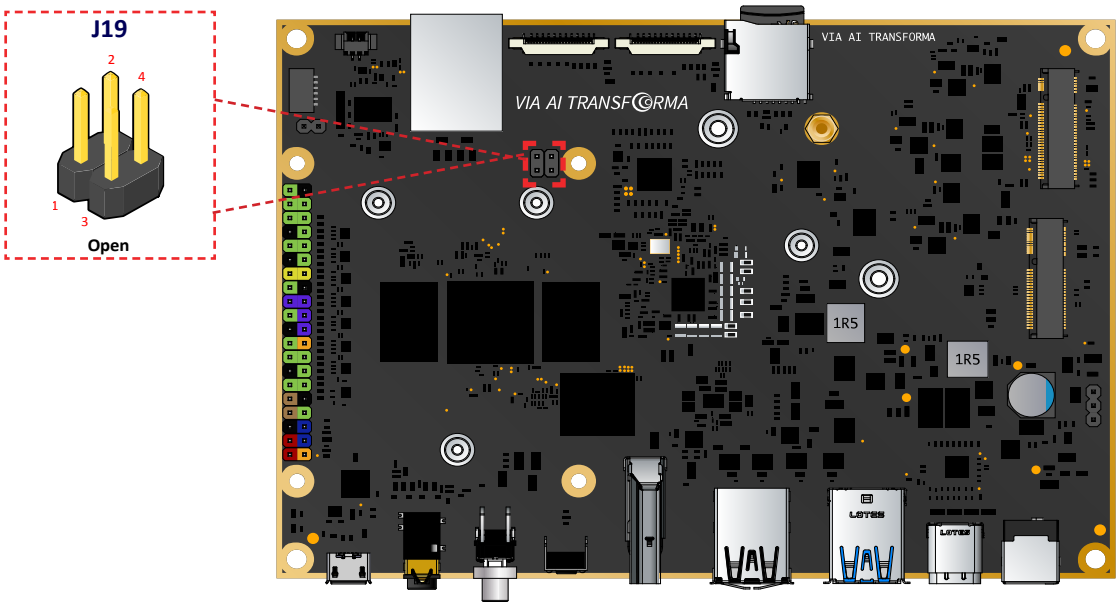

Figure 20: PoE header 'J19'

Pins	Signals
1	A+ (PIN1/2 for RJ45 cable)
2	A- (PIN3/6 for RJ45 cable)
3	B+ (PIN4/5 for RJ45 cable)
4	B- (PIN7/8 for RJ45 cable)

Table 06: PoE header 'J19' pins and signals

3. Hardware Installation

This chapter describes how to fix or connect the standard accessories provided in the VIA AI Transforma Model 1 board package.

3.1 Fixing the Plastic Spacers

Plastic spacers are provided to prop up the VIA AI Transforma Model 1 board for placement on a flat surface. Follow the instructions below to fix plastic spacers to each corner of the board:

1. Hold up the board.
2. From the board's bottom side, insert and push up the arrow-heads of the provided plastic spacers into the standoff holes located at the board's corners till a click sound is heard.

The VIA AI Transforma Model 1 board will now be propped up when placed on a flat surface.

3.2 Connecting the Power Adapter

A 5V 8A AC-to-DC power adapter and cable for US and EU are provided to supply power to the VIA AI Transforma Model 1 board. Follow the instructions below to connect the power adapter to the board:

1. Insert the desired plug head into the female plug end of the power cable.
2. Insert the male end of the power cable into the power adapter.
3. Connect the power adapter's DC plug to the DC-in jack located on the front coastline of the VIA AI Transforma Model 1 board.
4. Connect the power cable to a compatible power source.

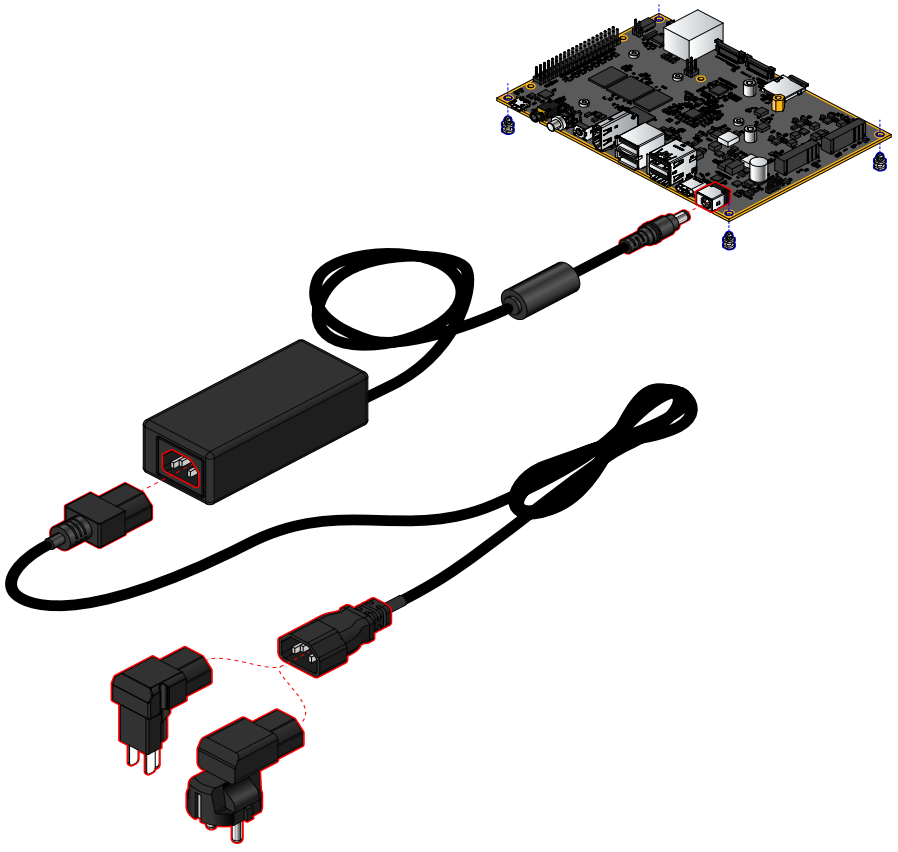

Figure 21: Fixing plastic spacers and connecting power adapter to the VIA AI Transforma Model 1 board

4. Software and Technical Support

4.1 Debian Support

The VIA AI Transforma Model 1 features a complete software evaluation image for the Debian 12 operating system.

4.2 Technical Support and Assistance

- For utilities downloads, latest documentation and information about the VIA AI Transforma Model 1, please visit our website at https://www.viatech.com/en/via-ai-transforma-model-1/.
- For technical support and additional assistance, always contact your local sales representative or board distributor, or go to https://www.viatech.com/en/support/drivers/ for technical support.
- For OEM clients and system integrators developing a product for long-term production, other code and resources may also be made available. Please visit our website at https://www.viatech.com/en/contact/ to submit a request.

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