Asus AAEON BOXER-8651AI User Manual

Ai@edge compact fanless embedded ai system with nvidia jetson orin nx

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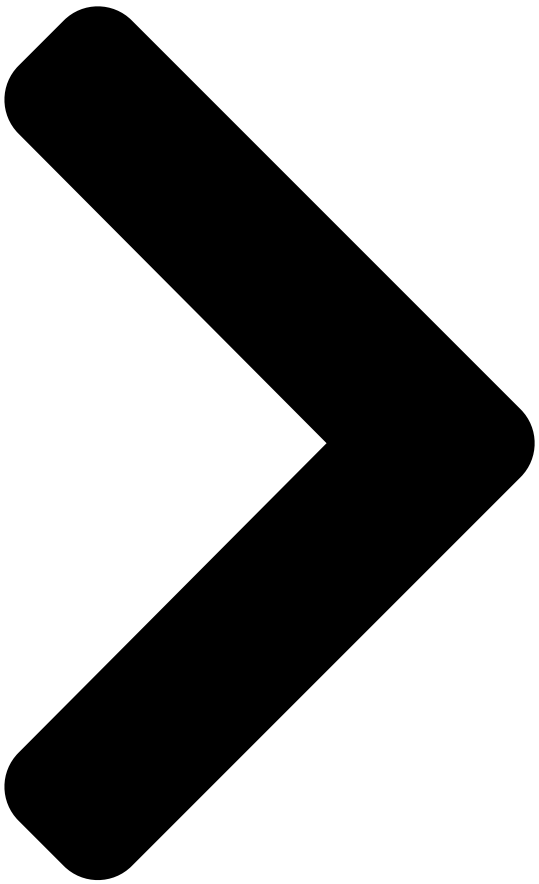

BOXER-8651AI

AI@Edge Compact Fanless Embedded AI System with NVIDIA® Jetson Orin™ NX

User's Manual 1st Ed

Last Updated: September 26 2023

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Related Manuals for Asus AAEON BOXER-8651AI

Network Hardware Asus AAEON BOXER-8256AI User Manual

(55 pages)

Network Hardware Asus AAEON BOXER-8621AI User Manual

Ai@edge compact fanless embedded ai system with nvidia jetson orin nano (51 pages)

Network Hardware Asus WL-HDD2.5 Quick Manual

(98 pages)

Network Hardware Asus AAM6020VI-T4 User Manual

Customer premises equipment (40 pages)

Network Hardware Asus Lyra Trio Manual

(170 pages)

Network Hardware Asus AAEON PER-T481 User Manual

(40 pages)

Network Hardware Asus AX200 Installation

Pcie wifi card/intel (2 pages)

Network Hardware Asus TC715 User Manual

Tc715 user manual. (40 pages)

Network Hardware Asus Aaeon ICS-6280 User Manual

Industrial network appliance (75 pages)

Network Hardware Asus Lyra Trio Quick Start Manual

(196 pages)

Network Hardware Asus Aaeon FWS-2273E7-A10-A10-00 User Manual

Desktop network appliance (101 pages)

Network Hardware Asus Aaeon FWS-2273 User Manual

Desktop network appliance (101 pages)

Network Hardware Asus AAEON FWS-7830 User Manual

(114 pages)

Network Hardware Asus EI-102 User Manual

Power over ethernet injector (41 pages)

Summary of Contents for Asus AAEON BOXER-8651AI

Page 1 BOXER-8651AI AI@Edge Compact Fanless Embedded AI System with NVIDIA ® Jetson Orin ™ User's Manual 1 Last Updated: September 26, 2023...

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Page 3 Acknowledgements All other products' name or trademarks are properties of their respective owners. NVIDIA®, the NVIDIA logo, Jetson™, Jetson Orin™ NX, and NVIDIA JetPack™ ● are trademarks of the NVIDIA Corporation. Arm® and Arm®v8-M architecture are registered trademarks of Arm Limited. ●...

Page 4 Packing List Before setting up your product, please make sure the following items have been shipped: Item Quantity BOXER-8651AI • Wallmount Bracket • Screw Package • Power Connector • Power Adapter (Optional) • Power Cord (Optional) • If any of these items are missing or damaged, please contact your distributor or sales representative immediately.

Page 5 About this Document This User's Manual contains all the essential information, such as detailed descriptions and explanations on the product's hardware and software features (if any), its specifications, dimensions, jumper/connector settings/definitions, and driver installation instructions (if any), to facilitate users in setting up their product. Users may refer to the product page at AAEON.com for the latest version of this document.

Page 6 Safety Precautions Please read the following safety instructions carefully. It is advised that you keep this manual for future references All cautions and warnings on the device should be noted. All cables and adapters supplied by AAEON are certified and in accordance with the material safety laws and regulations of the country of sale.

Page 7 As most electronic components are sensitive to static electrical charge, be sure to ground yourself to prevent static charge when installing the internal components. Use a grounding wrist strap and contain all electronic components in any static-shielded containers. If any of the following situations arises, please the contact our service personnel: Damaged power cord or plug Liquid intrusion to the device iii.

Page 8 FCC Statement This device complies with Part 15 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.

Page 9 China RoHS Requirements (CN) □□□□□□□□□□□□□□□□□□ AAEON System QO4-381 Rev.A0 □□□□□□□□□ □□□□ □ □ □ □□□ □□□□ □□□□ □(PBDE) (Pb) (Hg) (Cd) (Cr(VI)) (PBB) □□□□□ × ○ ○ ○ ○ ○ □ □□□□□ □□□□ × ○ ○ ○ ○ ○ □□□□□□ □□ ○...

Page 10 China RoHS Requirement (EN) Hazardous and Toxic Materials List AAEON System QO4-381 Rev.A0 Hazardous or Toxic Materials or Elements Component Name PCB and Components Wires & Connectors for Ext.Connections Chassis CPU & RAM HDD Drive LCD Module Optical Drive Touch Control Module Battery This form is prepared in compliance with the provisions of SJ/T 11364.

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Page 13: Chapter 1 - Product Specifications

Chapter 1 Chapter 1 - Product Specifications...

Page 14: Specifications

Specifications System AI Accelerator NVIDIA® Jetson Orin™ NX 6-core Arm® Cortex®-A78AE Armv8.2 64-bit CPU System Memory 8GB LPDDR5 Storage Device M.2 3052 B-Key x 1 for M.2 2242 B+M-Key SSD (Default Storage) M.2 2230 E-Key x 1 (Optional) Display Interface HDMI 2.1 (Type-A) x 1 Ethernet RJ-45 x 1 for GbE LAN...

Page 15 Power Supply Power Requirement 12V~24V DC in with 2-pin Terminal Block x 1 Mechanical Mounting Wallmount Dimensions (W x D x H) 4.13" x 3.54" x 2.05" (105mm x 90mm x 52mm), w/o bracket Gross Weight 2.4 lb. (1.1Kg) Net Weight 1.58 lb.

Page 16: Chapter 2 - Hardware Information

Chapter 2 Chapter 2 – Hardware Information...

Page 17: Dimensions

Dimensions Chapter 2 – Hardware Information...

Page 18: Jumpers And Connectors

Jumpers and Connectors Chapter 2 – Hardware Information...

Page 19 Bottom Chapter 2 – Hardware Information...

Page 20: List Of Jumpers

List of Jumpers The board has a number of jumpers that allow you to configure your system to suit your application. The table below shows the function of each of the board's jumpers Label Function AT/ATX Mode Selection 2.3.1 Jumper Settings You configure your card to match the needs of your application by setting jumpers.

Page 21: At/Atx Mode Selection (Cn2)

2.3.2 AT/ATX Mode Selection (CN2) CN2 Pin Function Close ATX Open AT (Default) Chapter 2 – Hardware Information...

Page 22: List Of Connectors

List of Connectors The board has a number of connectors that allow you to configure your system to suit your application. The table below shows the function of each of the board's connectors Label Function NVIDIA Jetson Orin NX Connector Front Panel Connector RTC Battery Connector Micro USB for Flash OS...

Page 23: Front Panel Connector (Cn2)

2.4.1 Front Panel Connector (CN2) Signal Signal Button power Recovery System Reset AC OK PD 10Kohm 3.3V AO 5V AO 2.4.2 RTC Connector (CN3) Signal Signal Chapter 2 – Hardware Information...

Page 24: Micro Usb (Flash Os) (Cn4)

2.4.3 Micro USB (Flash OS) (CN4) Signal Signal USB1- USB1+ 2.4.4 HDMI Connector (CN5) Signal Signal HDMI_DATA2_P HDMI_DATA2_N HDMI_DATA1_P HDMI_DATA1_N HDMI_DATA0_P HDMI_DATA0_N HDMI_CLK_P HDMI_CLK_N HDMI_SCL HDMI_SDA Chapter 2 – Hardware Information...

Page 25: Com Port Connector (Rs-232 + Canbus) (Cn6)

Signal Signal HDMI_PWR HDMI_HDP 2.4.5 COM Port Connector (RS-232 + CANBus) (CN6) RS-232 CANBus CAN0_L CAN0_H RTS# CTS# Chapter 2 – Hardware Information...

Page 26 DB-9 Port (Male) RS-232 CANBus CAN0_L CAN0_H RTS# CTS# Chapter 2 – Hardware Information...

Page 27: Com Port Connector (Rs-232/422/485) (Cn7/Sw2)

2.4.6 COM Port Connector (RS-232/422/485) (CN7/SW2) RS-232 RS-422 CANBus TXD- TXD- RXD+ TXD+ TXD+ RXD- Chapter 2 – Hardware Information...

Page 28: Rs-232/422/485 Select (Sw2)

2.4.7 RS-232/422/485 Select (SW2) Mode 1T/1R RS-232 1T/1R RS-422 1T/1R RS-485 Low power shutdown 250kbps for RS-232 and RS-485/RS-422 RS-232 to 3Mbps and RS-485/RS-422 to 20Mbps Enable RS-422/RS-485 Bias and Termination Resistors. Disable RS-422/RS-485 Bias and Termination Resistors. Chapter 2 – Hardware Information...

Page 29: Dio Port Connector (Cn8)

2.4.8 DIO Port Connector (CN8) Function DTS Name GPIO GPIO13 PH.00 I2S0 LRCK PI.02 GPIO11 PQ.06 I2S0 SDIN PI.01 GPIO09 PAC.06 I2S0 SDOUT PI.00 GPIO01 PQ.05 I2S0 SCLK PH.07 Export

GPIO then you can control GPIO from user space through sysfs. For example: GPIO ID:PY.02 Export PY.02...

Page 30: Com+Dio Port Connector (Cn7+Cn8/Sw2)

2. Set GPIO direction to input mode # echo "in" > /sys/class/gpio/PY.02/direction # cat /sys/class/gpio/PY.02/value #Read GPIO input value Unexport PY.02 # echo PY.02 > /sys/class/gpio/unexport 2.4.9 COM+DIO port Connector (CN7+CN8/SW2) DB-15 Port (Female) RS-232 RS-422 RS-485 Function DTS Name GPIO No.

Page 31: Uart Debug Port Connector (Cn9)

RS-232 RS-422 RS-485 I2S0_SCLK PH.07 2.4.10 UART Debug Port Connector (CN9) Signal VCC 3.3V UART TX UART RX 2.4.11 RJ-45 Connector (CN10) Signal Signal MDI0+ MDI0- MDI1+ MDI1- MDI2+ MDI2- MDI3+ MDI3- Note: Speed LED 1000Base-T Green, 10/100Base-T no LED. Chapter 2 –...

Page 32: 2230 E-Key (Cn11)

2.4.12 M.2 2230 E-Key (CN11) Chapter 2 – Hardware Information...

Page 33: Connector (Cn10)

2.4.13 RJ-45 Connector (CN10) Signal Signal MDI0+ MDI0- 2.4.14 USB 3.2 Gen 2 Type-A Port (CN13) Signal Signal VBUS_1 VBUS_2 (A)D- (B)D- (A)D+ (B)D+ (A)SSRX- (B)SSRX- (A)SSRX+ (B)SSRX+ Chapter 2 – Hardware Information...

Page 34: Usb 2.0 Type-A Port (Cn14)

Signal Signal (A)SSTX- (B)SSTX- (A)SSTX+ (B)SSTX+ 2.4.15 USB 2.0 Type-A Port (CN14) Signal Signal VBUS_1 VBUS_2 (A)D- (B)D- (A)D+ (B)D+ 2.4.16 DC Power In Connector (CN19) Signal Signal PWR_IN Chapter 2 – Hardware Information...

Page 35: Nano Sim Connector (Cn20)

2.4.17 Nano SIM Connector (CN20) Signal Chapter 2 – Hardware Information...

Page 36: 3052 B-Key (Cn21)

2.4.18 M.2 3052 B-Key (CN21) Chapter 2 – Hardware Information...

Page 37: Hardware Installation

Hardware Installation 2.5.1 Expansion Module Installation Before installing your expansion module, ensure the system is powered down and disconnect the power cord from the system. Make sure you have the expansion module(s) ready to install. See Chapter 1 for expansion module specifications for compatibility.

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To access the interior, first remove the four (4) screws on the bottom of the chassis, as shown. Chapter 2 – Hardware Information...

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M.2 3042 B-Key (M.2 2242 B + M-Key Storage Module) Chapter 2 – Hardware Information...

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M.2 3052 B-Key Chapter 2 – Hardware Information...

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M.2 2230 E-Key Chapter 2 – Hardware Information...

Page 42: Chapter 3 - Bsp Flash Guide

Chapter 3 Chapter 3 – BSP Flash Guide...

Page 43: Before Installation

Before Installation Before starting the process make sure your BOXER-8651AI system is turned off and the power is disconnected. You will need a Host PC running Ubuntu 18.04, and make sure the NVIDIA® Jetson Orin™ NX module is installed onto the BOXER-8651AI carrier board

system.

Page 44: Connecting To Pc/Force Recovery Mode

Connecting to PC/Force Recovery Mode Step 1: On the Host computer, open Linux terminal and enter the following command to extract the compressed BSP image files (BSP file name may vary): $ sudo tar -zxvf BOXER_8651AI_J5.1.1_A00_1.0.2_20230822.tar.gz Note: Do not decompress the file (Internal.tar.gz) using a Windows OS, BSP should only be decompressed in a Linux EXT3/4 file system.

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Press and hold the recovery key button. While holding the recovery key button, power on the system, and continue to hold the recovery key button for two seconds, then release. The BOXER-8651AI should then enter recovery mode. To check if device is in recovery mode, enter the lsusb command in the terminal on the Host PC.

Page 46: Flash Image To Board

Flash Image to Board Use the following steps to flash the OS to the BOXER-8651AI. Open terminal on the Ubuntu Host PC, then access the folder you extracted in the previous section. Enter the following command in terminal to flash the image: $ ./flashboxer.sh -s 62517420 nvme Wait until the image is installed.

Page 47: Check Bsp Version

Check BSP Version Once the flash image is successfully installed, the BOXER-8651AI will reboot automatically, then check the BSP version to see if the system is flashing the correct version of BSP . Open a Terminal, and type command “cat /proc/product”...

Page 48: Chapter 4 - Os User Guide

Chapter 4 Chapter 4 – OS User Guide...

Page 49: Introduction

Introduction The BOXER-8651AI’s OS, Ubuntu/Linux version, and preinstalled SDK components are as follows: Jetpack 5.1.1 (l4t 35.3.1) Ubuntu/Linux version Ubuntu version: 20.04.6 Kernel version: 5.10.104-tegra UEFI version: 3.1-32827747 Built-in all Jetson SDK Components CUDA Toolkit for L4T 11.4.19 cuDNN 8.6.0 TensorRT 8.5.2 OpenCV 4.5.4 VPI 2.2...

Page 50: Update Note

Update Note Running $ sudo apt upgrade command in terminal will overwrite the Aaeon kernel device tree (.dtb)/kernel image(Image)/bootloader in OS, which can lead to unexpected results including losing I/O ports. So Aaeon default disable Nvidia apt Repo for updating Nvidia apt package.

Page 51: Boxer-8651Ai Power Mode

BOXER-8651AI Power Mode NVIDIA® Jetson Orin™ NX power mode can be selected and monitored by GUI, please refer to the following picture: Note: Power mode is dependent on DRAM size. For more detailed information please visit https://developer.nvidia.com/embedded/jetson-modules Chapter 4 – OS User Guide...