

BOXER-RK88-0001

Rockchip RK3288 Platform

User's Manual 1st Ed

Copyright Notice

This document is copyrighted, 2018. All rights are reserved. The original manufacturer reserves the right to make improvements to the products described in this manual at any time without notice.

No part of this manual may be reproduced, copied, translated, or transmitted in any form or by any means without the prior written permission of the original manufacturer. Information provided in this manual is intended to be accurate and reliable. However, the original manufacturer assumes no responsibility for its use, or for any infringements upon the rights of third parties that may result from its use.

The material in this document is for product information only and is subject to change without notice. While reasonable efforts have been made in the preparation of this document to assure its accuracy, AAEON assumes no liabilities resulting from errors or omissions in this document, or from the use of the information contained herein.

AAEON reserves the right to make changes in the product design without notice to its users.

Acknowledgement

All other products' name or trademarks are properties of their respective owners.

- Microsoft Windows® is a registered trademark of Microsoft Corp.
- ITE is a trademark of Integrated Technology Express, Inc.
- IBM, PC/AT, PS/2, and VGA are trademarks of International Business Machines Corporation.

All other product names or trademarks are properties of their respective owners.

Packing List

Before setting up your product, please make sure the following items have been shipped:

Item	Quantity
● RICO-3288	1
● RTC Battery	1
● DC Power Cable	1

If any of these items are missing or damaged, please contact your distributor or sales representative immediately.

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 AAEON.com for the latest version of this document.

Safety Precautions

Please read the following safety instructions carefully. It is advised that you keep this manual for future references

1. All cautions and warnings on the device should be noted.
2. Make sure the power source matches the power rating of the device.
3. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
4. Always completely disconnect the power before working on the system's hardware.
5. No connections should be made when the system is powered as a sudden rush of power may damage sensitive electronic components.
6. If the device is not to be used for a long time, disconnect it from the power supply to avoid damage by transient over-voltage.
7. Always disconnect this device from any AC supply before cleaning.
8. While cleaning, use a damp cloth instead of liquid or spray detergents.
9. Make sure the device is installed near a power outlet and is easily accessible.
10. Keep this device away from humidity.
11. Place the device on a solid surface during installation to prevent falls
12. Do not cover the openings on the device to ensure optimal heat dissipation.
13. Watch out for high temperatures when the system is running.
14. Do not touch the heat sink or heat spreader when the system is running
15. Never pour any liquid into the openings. This could cause fire or electric shock.
16. 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.

17. If any of the following situations arises, please the contact our service personnel:
 - i. Damaged power cord or plug
 - ii. Liquid intrusion to the device
 - iii. Exposure to moisture
 - iv. Device is not working as expected or in a manner as described in this manual
 - v. The device is dropped or damaged
 - vi. Any obvious signs of damage displayed on the device
18. **DO NOT LEAVE THIS DEVICE IN AN UNCONTROLLED ENVIRONMENT WHERE THE STORAGE TEMPERATURE IS BELOW -20° C (-4°F) OR ABOVE 60°C (140°F) TO PREVENT DAMAGE.**

Warning!



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.

Caution:

There is a danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions and your local government's recycling or disposal directives.

Attention:

Il y a un risque d'explosion si la batterie est remplacée de façon incorrecte. Ne la remplacer qu'avec le même modèle ou équivalent recommandé par le constructeur. Recycler les batteries usées en accord avec les instructions du fabricant et les directives gouvernementales de recyclage.

Caution:

(1) FCC Caution

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

(2) Radiation Exposure Statement:

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

China RoHS Requirements (CN)

产品中有毒有害物质或元素名称及含量

AAEON Main Board/ Daughter Board/ Backplane

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷电路板 及其电子组件	○	○	○	○	○	○
外部信号 连接器及线材	○	○	○	○	○	○

○: 表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T 11363-2006 标准规定的限量要求以下。

X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T 11363-2006 标准规定的限量要求。

备注: 此产品所标示之环保使用期限, 系指在一般正常使用状况下。

China RoHS Requirement (EN)

Poisonous or Hazardous Substances or Elements in Products

AAEON Main Board/ Daughter Board/ Backplane

Component	Poisonous or Hazardous Substances or Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
PCB & Other Components	○	○	○	○	○	○
Wires & Connectors for External Connections	○	○	○	○	○	○
<p>O: The quantity of poisonous or hazardous substances or elements found in each of the component's parts is below the SJ/T 11363-2006-stipulated requirement.</p> <p>X: The quantity of poisonous or hazardous substances or elements found in at least one of the component's parts is beyond the SJ/T 11363-2006-stipulated requirement.</p> <p>Note: The Environment Friendly Use Period as labeled on this product is applicable under normal usage only</p>						

Table of Contents

Chapter 1 - Product Specifications	1
1.1 Specifications.....	2
Chapter 2 – Hardware Information	4
2.1 Dimensions	5
2.2 Jumpers and Connectors	6
2.3 List of Jumpers	7
2.3.1 JP1: LVDS power	7
2.3.2 JP2: Backlight power	7
2.3.3 JP3: RS232 output power	7
2.3.4 JP4: Update image.....	8
2.3.5 JP5: Integrated3 (220-97-05GB01).....	8
2.3.6 JP6: Power button (220-96-02GB01).....	8
2.3.7 JP7/JP8: COM port setting.....	8
2.3.8 JP7/JP8: COM port setting.....	9
2.4 List of Connectors.....	10
2.4.2 CN4: LVDS (712-76-30GWE0)	11
2.4.3 CN7: Debug port (712-71-09TW01).....	11
2.4.4 CN8: Giga LAN (RJL4A-4WH1-FP0-0R 90D(F)).....	11
2.4.5 CN9: USB (1201-700-08S)	12
2.4.6 CN11: Integrated 1 (710-73-09TW01).....	12
2.4.7 CN12: RS232 (220-97-05GB01)	13
2.4.8 CN14: eDP (20455-030E-12).....	13
2.4.9 CN18: uSD (112J-TDAR-R)	14
2.4.10 CN21: USB OTG(TMC106-USBD05-835).....	14
2.4.12 CN25: DC 12V Power	14
2.4.13 CN30: mPCIe (AS0B22x-S56Q-7H)	15

2.4.14	CN31: GPIO (220-97-05GB01).....	15
2.4.15	CN34: Backlight (721-81-05TW00).....	16
2.4.16	CN35: Speaker(712-H71-105W01)	16
2.4.17	CN37: MIPI (AYF333135).....	17
2.4.18	CN38: HDMI type A(QJ51191-LFB4-7F)	17
2.4.19	CN40: RS232 (712-71-09TW01).....	18
2.5	Function Block.....	19

Chapter 1

Product Specifications

1.1 Specifications

System

- **Form Factor** 2.5" Board (PICO ITX)
- **Processor** Rockchip RK3288 (ARM Cortex™ A17 Quad-core 1.6GHz)
- **System Memory** Onboard DDR3L 2GB RAM
- **Storage** 16GB eMMC and Micro SD card
- **Power Requirement** DC 12 V
- **Power Consumption** 0.6A@12V, full load, Quad CPU
- **Board Size** 100 x 72 mm (3.94 x 2.84")
- **Gross Weight** 200 g (0.44 .lb)
- **Operating Temperature** 0 ~ 60°C (32 ~ 140°F)
- **Storage Temperature** -40 ~ 80°C (-40 ~176°F)
- **Operation Humidity** 5 ~ 90% relative humidity, non-condensing

Display

- **Chipset** Rockchip RK3288 (ARM Cortex™ A17 Quad-core 1.6GHz)
- **Resolution** HDMI(2.0) up to 4k x 2k @60Hz
- **LCD Interface** LVDS (18/24bit 2CH) 1920 x 1200 eDP up to 2560 x 1400 @60Hz

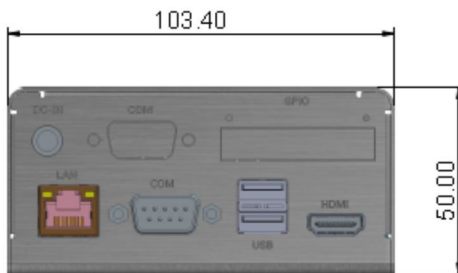
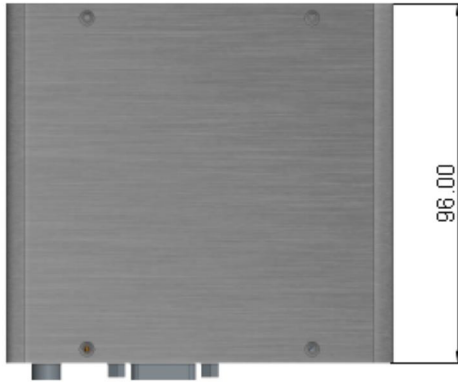
I/O

- Network (LAN) 1 x RJ45, Giga Ethernet
- Serial Port 1 x RS232/422/485 D-SUB9 connector
1 x RS232 connector
- USB(2.0) 2 x USB2.0 Type A
1 x Micro USB(OTG)
- Video 1 x Audio connector
- Audio Support 2.5W(by 4Ω) L/R Speaker
Support Line in(Microphone)
- LVDS Support RGB 18/24bit, Dual Channel
Support Selectable 3.3V/5V panel power
- eDP 1 x eDP connector
Support 4K x 2K @ 30fps
- Backlight 1 x Backlight connector
Support Selectable 5V/12V
- Integrated Function 1 1 x USB2.0
2 x I2C(3.3V)
- Integrated Function 2 1 x Integrated connector for daughter board
- GPIO 1 x GPIO connector
(8 x GPIO, 1 x 3.3V DC output, 1 x GND)
- RTC Battery 1 x RTC battery connector
- Power Input 1 x 12V DC input connector
- Mini PCIe Slot 1 x Full Size mPCIe slot
- SIM Slot 1 x Mano-SIM slot

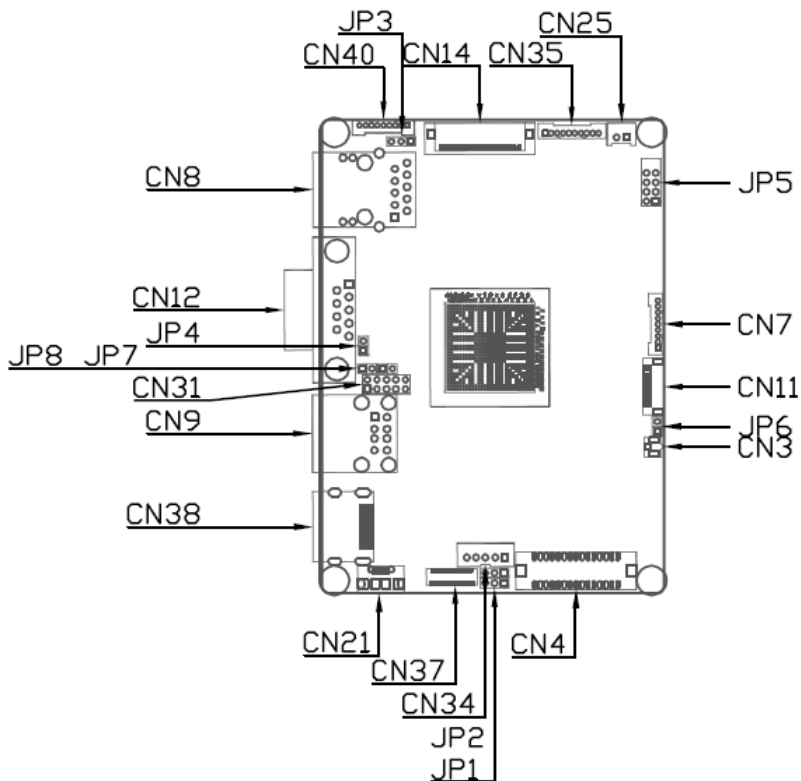
Chapter 2

Hardware Information

2.1 Dimensions



2.2 Jumpers and Connectors



2.3 List of Jumpers

Please refer to the table below for all of the board's jumpers that you can configure for your application

Label	Function
JP1(1,3,5)	Clear CMOS Jumper
JP1(2,4,6)	Auto Power Button Enable/Disable Selection
JP2(1,3,5)	LVDS Port Operating Voltage Selection
JP2(2,4,6)	LVDS Port Backlight Inverter Voltage Selection
JP3	LVDS Port Backlight Lightness Control Mode Selection

2.3.1 JP1: LVDS power

Pin	Definition
1-2	+5V
2-3	+3.3V

2.3.2 JP2: Backlight power

Pin	Definition
1	GND
2	Reserve

2.3.3 JP3: RS232 output power

Pin	Definition
1-2	+12V

2-3	+5V
-----	-----

2.3.4 JP4: Update image

Mode	JP4
Normal mode	Open
Update image	Short

2.3.5 JP5: Integrated3 (220-97-05GB01)

Pin	Definition	Pin	Definition
1	+3.3V	6	I2C1_CLK
2	GPIO0	7	GND
3	UART4_TX	8	I2C1_DATA
4	GPIO1	9	GPIO2
5	UART4_RX	10	GPIO3

2.3.6 JP6: Power button (220-96-02GB01)

Pin	Definition
1-2	+5V
2-3	+12V

2.3.7 JP7/JP8: COM port setting

Mode	JP7	JP9
RS422	Open	Open
RS232	Open	Short
RS485	Short	Short

2.3.8 JP7/JP8: COM port setting

Mode	JP7	JP9
RS422	Open	Open
RS232	Open	Short
RS485	Short	Short

2.4 List of Connectors

Please refer to the table below for all of the board's connectors that you can configure for your application

Label	Function
CN1	Digital IO Port
CN2	LVDS Port Inverter / Backlight Connector
CN3	Front Panel
CN4	Mini-Card Slot (Half-Mini Card)
CN5	SPI Programming Header
CN6	Mini-Card Slot (Full-Mini Card)/mSATA (By BOM)
CN7	BIO connector
CN8	SATA Port
CN9	Battery
CN10	LAN (RJ-45) Port
CN11	USB 3.0 Port 1,2
CN12	+5V Output for SATA HDD
CN13	HDMI port
CN14	External +12V Input
CN15	DDR3L SO-DIMM Slot
CN16	LVDS Port
CN17	COM Port 1/2 & line out connector
CN18	LPC Port
CN19	USB 2.0 Port 1

2.4.2 CN4: LVDS (712-76-30GWE0)

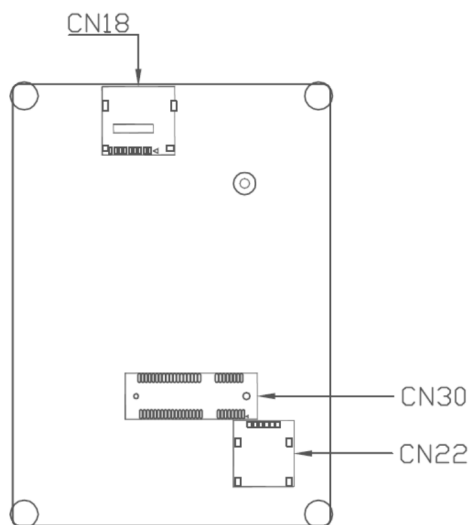
Pin	Definition	Pin	Definition	Pin	Definition
1	BKL_ENABLE	11	LVDS_DA1-	21	LVDS_DA6-
2	BKL_CONTROL	12	LVDS_DA1+	22	LVDS_DA6+
3	LCD_PWR	13	LVDS_DA2-	23	LVDS_DA7-
4	GND	14	LVDS_DA2+	24	LVDS_DA7+
5	LVDS_A_CLK-	15	LVDS_DA3-	25	LVDS_DA8-
6	LVDS_A_CLK+	16	LVDS_DA3+	26	LVDS_DA8+
7	LCD_PWR	17	DDC_DATA	27	LCD_PWR
8	GND	18	DDC_CLK	28	GND
9	LVDS_DA0-	19	LVDS_DA5-	29	LVDS_B_CLK-

2.4.3 CN7: Debug port (712-71-09TW01)

Pin	Definition	Pin	Definition
1	N.C	6	N.C
2	N.C	7	N.C
3	RX	8	N.C
4	N.C	9	GND
5	TX		

2.4.4 CN8: Giga LAN (RJL4A-4WH1-FP0-0R 90D(F))

Pin	Definition	Pin	Definition
1	TX+_D1	5	BI-_D3
2	TX-_D1	6	RX-_D2
3	RX+_D2	7	BI+_D4
4	BI+_D3	8	BI-_D4



2.4.5 CN9: USB (1201-700-08S)

Pin	Definition	Pin	Definition
1	+5V	5	+5V
2	USB2_D-	6	USB3_D-
3	USB2_D+	7	USB3_D+
4	GND	8	GND

2.4.6 CN11: Integrated 1 (710-73-09TW01)

Pin	Definition	Pin	Definition
1	I2C4_CLK	6	USB1_D-
2	I2C4_DATA	7	I2C3_CLK
3	GND	8	I2C3_DATA
4	+5V	9	NFC_DFU
5	USB1_D+		

2.4.7 CN12: RS232 (220-97-05GB01)

Pin	Definition	Pin	Definition
1	DCD	6	DSR
2	RX	7	RTS
3	TX	8	CTS
4	DTR	9	Vout(refer to JP3)
5	GND		

2.4.8 CN14: eDP (20455-030E-12)

Pin	Definition	Pin	Definition	Pin	Definition
1	GND	11	GND	21	eDP_HPDP
2	eDP_TX0-	12	LCD_PWR	22	BKL_ENABLE
3	eDP_TX0+	13	LCD_PWR	23	BKL_CONTROL
4	GND	14	eDP_TX3-	24	GND
5	eDP_TX1-	15	eDP_TX3+	25	GND

Pin	Definition	Pin	Definition	Pin	Definition
6	eDP_TX1+	16	GND	26	BKL_PWR
7	GND	17	eDP_AUX-	27	BKL_PWR
8	eDP_TX2-	18	eDP_AUX+	28	BKL_PWR
9	eDP_TX2+	19	GND	29	BKL_PWR

2.4.9 CN18: uSD (112J-TDAR-R)

Pin	Definition	Pin	Definition
1	DAT2	6	GND
2	DAT3	7	DAT0
3	CMD	8	DAT1
4	+3.3V	9	CD
5	CLK	10	GND

2.4.10CN21: USB OTG(TMC106-USBD05-835)

Pin	Definition
1	+5V
2	OTG_USB_D-
3	OTG_USB_D+
4	OTG_ID

2.4.12CN25: DC 12V Power

Pin	Definition
-----	------------

1	GND
2	+12V

2.4.13CN30: mPCIe (AS0B22x-S56Q-7H)

Pin	Definition	Pin	Definition	Pin	Definition	Pin	Definition
1	WAKE_UP	14	USIM_RESET	27	GND	40	GND
2	+3.3V	15	GND	28	N.C	41	+3.3V
3	N.C	16	N.C	29	GND	42	N.C
4	GND	17	WAKE_UP_OUT	30	N.C	43	GND
5	N.C	18	GND	31	N.C	44	N.C
6	N.C	19	N.C	32	N.C	45	N.C
7	N.C	20	DISABLE	33	N.C	46	N.C
8	USIM_PWR	21	GND	34	GND	47	N.C
9	GND	22	RESET	35	N.C	48	N.C
10	USIM_DATA	23	N.C	36	USB1_D-	49	N.C
11	N.C	24	+3.3V	37	GND	50	GND
12	USIM_CLK	25	N.C	38	USB1_D+	51	N.C
13	N.C	26	GND	39	+3.3V	52	+3.3V

2.4.14CN31: GPIO (220-97-05GB01)

Pin	Definition	Pin	Definition
-----	------------	-----	------------

1	GPO0	6	GPI2
2	GPI0	7	GPO3
3	GPO1	8	GPI3
4	GPI1	9	+3.3V
5	GPO2	10	GND

2.4.15CN34: Backlight (721-81-05TW00)

Pin	Definition
1	BKL_PWR
2	BKL_CONTROL
3	GND
4	GND
5	BKL_ENABLE

2.4.16CN35: Speaker(712-H71-105W01)

Pin	Definition
1	GND
2	MIC
3	HP_DET
4	GND
5	LEFT_OUT
6	RIGHT_OUT
7	Spk_L_P
8	Spk_L_N
9	Spk_R_P

10	Spk_R_N
----	---------

2.4.17CN37: MIPI (AYF333135)

Pin	Definition	Pin	Definition	Pin	Definition	Pin	Definition
1	LED+	11	CCM_RESET	21	GND	31	GND
2	LED+	12	GND	22	DSI_CLK+		
3	LED-	13	CCM_PWDN	23	DSI_CLK-		
4	LED-	14	CCM_MCLK	24	GND		
5	LCD_ID	15	GND	25	DSI_D2+		
6	DOVDD_1.8V	16	DSI_D0-	26	DSI_D2-		
7	DSI_TE	17	DSI_D0+	27	GND		
8	AVDD_2.8V	18	GND	28	DSI_D3+		
9	I2C_DATA	19	DSI_D1+	29	DSI_D3-		
10	I2C_CLK	20	DSI_D1-	30	GND		

2.4.18CN38: HDMI type A(QJ51191-LFB4-7F)

Pin	Definition	Pin	Definition
1	HDMI_TX2P	11	GND
2	GND	12	HDMI_CLKN
3	HDMI_TX2N	13	HDMI_CEC
4	HDMI_TX1P	14	N.C
5	GND	15	DDC_SCL

6	HDMI_TX1N	16	DDC_SDA
7	HDMI_TX0P	17	GND
8	GND	18	+5V
9	HDMI_TX0N	19	HDMI_HPD
10	HDMI_CLKP		

2.4.19CN40: RS232 (712-71-09TW01)

Pin	Definition	Pin	Definition
1	N.C	6	CTS
2	N.C	7	N.C
3	RX	8	N.C
4	RTS	9	GND
5	TX		
6	GND	GND	

2.5 Turning on/off your BOXER-RK88



1. Connect your BOXER-RK88 to other devices before you connect power.
2. Turning On the Device:
Plug the power adapter to the power source, and then connect the power adapter to the power socket of your BOXER-RK88. The system runs automatically.
3. Turning Off the Device:
Disconnect the power source and the unit will turn off.