

# RICO-3288

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Rockchip RK3288 Platform

User's Manual 3<sup>rd</sup> Ed

## Copyright Notice

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## Packing List

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

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

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

## About this Document

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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 on [AAEON.com](http://AAEON.com) for the latest version of this document.

## Safety Precautions

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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.*



## 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	○	○	○	○	○	○

O: 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><b>Note:</b> The Environment Friendly Use Period as labeled on this product is applicable under normal usage only</p>						

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# Chapter 1

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Product Specifications

## 1.1 Specifications

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### System

Form Factor	Pico-ITX (100mm x 72mm)
CPU	Rockchip RK3288 ARM Cortex™-A17 Quad-core 1.6 GHz
GPU	Mali-T764
Graphics	Video Decode: MPEG-1, MPEG-2, MPEG-4, H.263, H.264, AVS, VC-1, VP8, MVC Video Encode: H.264 (BP @ level4.0, MP @ level4.0, HP@level4.0), MVC and VP8
Memory Capacity	Onboard DDR3L 2GB
Storage/SSD	16GB eMMC and Micro-SD Card
Operating System	Android 6.0
Kernel	Kernel 4.4
Watchdog Timer	Integrated
Power Requirement	+12V DC input, Optional 7.4V battery
Power Consumption (Typical)	0.6A@12V, full load, Quad-core CPU
Dimension	3.94" x 2.84" (100mm x 72mm)
Gross Weight	0.44 lbs. (0.2 kg)
Operating Temperature	32°F ~ 140°F (0°C ~ 60°C)
Storage Temperature	-40°F ~ 176°F (-40°C ~ 80°C)
Operating Humidity	0% ~ 90% relative humidity, non-condensing
MTBF (Hours)	80,000
Certification	CE/FCC

## Display

HDMI	HDMI 1.4 up to 4K x 2K @ 60Hz
eDP	Up to 2560 x 1440 @ 60Hz
LVDS	Support 18/24-bit up to 1920 x 1080 @ 60Hz
MIPI	Up to 2560 x 1440 @ 60Hz

## Display

Wi-Fi	802.11 a/b/g/n/ac
Bluetooth	Bluetooth V4.2 + EDR

## I/O

Ethernet	Gigabit Ethernet x 1
USB Port	Micro-USB OTG x 1 USB 2.0 Type A x 2 USB2.0 Pin header x 1 (Integrated)
Serial Port	RS-232/422/485 x 1 RS-232 Pin header x 1 Debug port pin header x 1
Audio	2.5W (by 4 $\Omega$ ) Speaker/ Microphone/ Earphone
GPIO	8-bit (4-in, 4-out)
Expansion Slot	Full-size mini-PCIe slot x 1 (For 3G/4G card)
SIM Slot	Nano-SIM
SD Socket	Support Micro-SD card
Camera	—

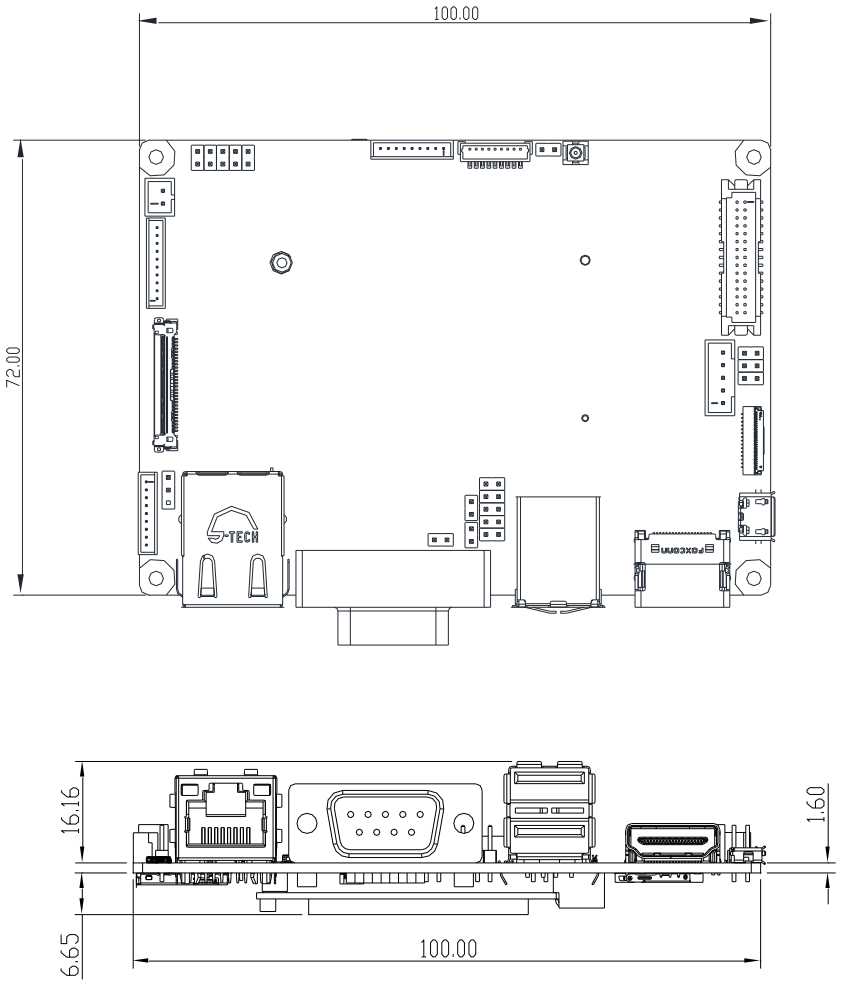
# Chapter 2

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Hardware Information

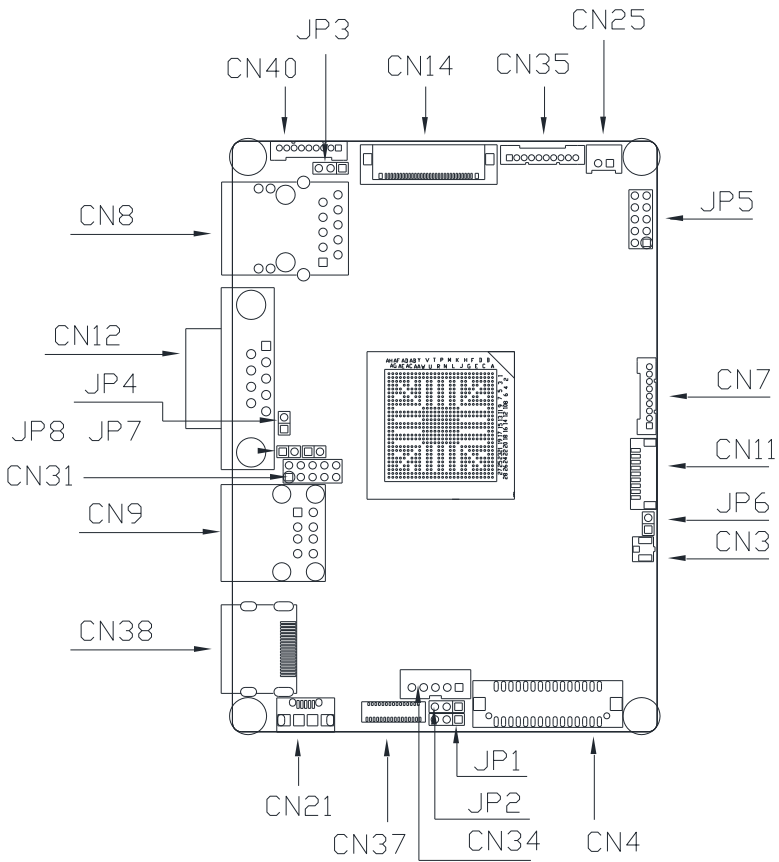


## 2.1 Dimensions

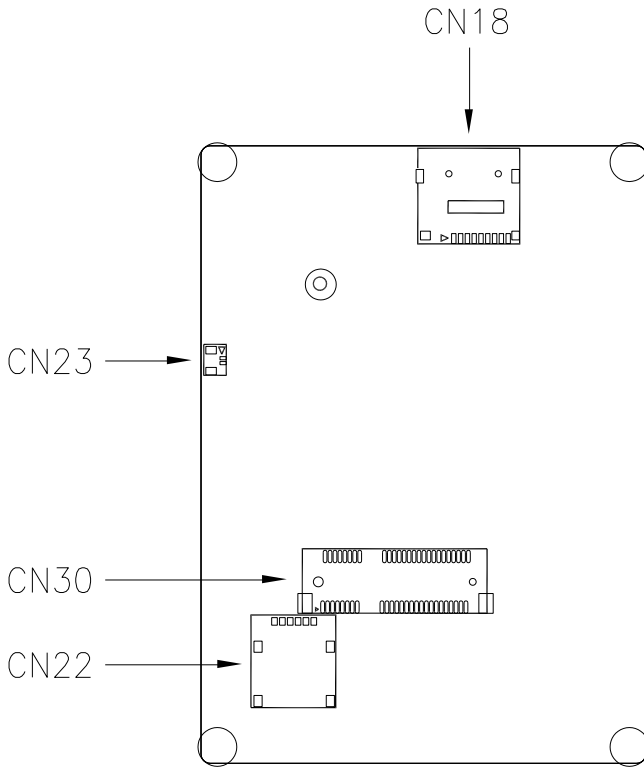


## 2.2 Jumpers and Connectors

Top



Bottom



## 2.3 List of Jumpers

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

Label	Function
JP1	LVDS Power Selection
JP2	Backlight Power Selection
JP3	RS-232/422/485 (D-Sub 9) Voltage Output Selection
JP4	Image Update
JP5	Integrated UART/ I2C/ GPIO/ Others
JP6	Power Button (Optional)
JP7/ JP8	RS-232/422/485 (D-Sub 9) Setting

### 2.3.1 LVDS Power Selection (JP1)

---

Pin Setting	Mode
1-2	+5V
2-3	+3.3V (Default)

### 2.3.2 Backlight Power Selection (JP2)

---

Pin Setting	Mode
1-2	+5V (Default)
2-3	+12V

### 2.3.3 RS-232/422/485 (D-Sub 9) Voltage Output Selection (JP3)

---

Pin Setting	Mode
1-2	+12V
2-3	+5V

### 2.3.4 Image Update (JP4)

---

Pin Setting	Mode
Open	Normal Mode
Short	Update

### 2.3.5 Integrated UART/ I2C/ GPIO/ Others (JP5)

---

Pin	Definition	Pin	Definition
1	+3.3V	6	I2C1_CLK
2	Battery Detect	7	GND
3	UART4_TX	8	I2C1_DATA
4	Disable charger	9	GPIO
5	UART4_RX	10	GPIO

### 2.3.6 Power Button (JP6) (Optional)

---

Pin	Definition
1	GND
2	Reserve

### 2.3.7 RS-232/422/485 (D-Sub 9) Setting (JP7/JP8)

---

Mode	JP7	JP8
RS-485	Open	Open
RS-232	Short (Default)	Open (Default)
RS-422	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. For connector vendor and model information, please refer to Appendix A.

Label	Function
CN3	I-PEX Connector for Wi-Fi
CN4	LVDS Connector
CN7	Debug Port
CN8	Gigabit Ethernet (GbE) Port
CN9	Dual USB Port
CN11	Integrated USB, I2C x 2, 5V
CN12	RS-232/422/485 Port (D-Sub 9)
CN14	eDP Connector
CN18	Micro-SD Card Slot
CN21	Micro-USB OTG Port
CN22	Nano-SIM Card Slot
CN23	RTC Battery Connector
CN25	DC Power Input
CN30	mPCIe Slot for WWAN Card
CN31	GPIO Port
CN34	LCD Backlight Connector
CN35	Speaker Connector
CN37	MIPI Connector
CN38	HDMI 1.4 Port Type A
CN40	RS-232 Connector

## 2.4.1 I-PEX Connector for Wi-Fi (CN3)

Standard specifications.

## 2.4.2 LVDS Connector (CN4)

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-
10	LVDS_DA0+	20	LVDS_DA5+	30	LVDS_B_CLK+

## 2.4.3 Debug Port (CN7)

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 Gigabit Ethernet (GbE) Port (CN8)

---

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 Dual USB Port (CN9)

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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 Integrated USB, I2C x 2, 5V (CN11)

---

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 RS-232/422/485 Port (D-Sub 9) (CN12)

### RS232 Mode

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

### RS485 Mode

Pin	Definition	Pin	Definition
1	RS485_D-(B)	6	N.C
2	RS485_D+(A)	7	N.C
3	N.C	8	N.C
4	N.C	9	N.C
5	N.C		

### RS422 Mode

Pin	Definition	Pin	Definition
1	RS422_TX-(B)	6	N.C
2	RS422_TX+(A)	7	N.C
3	RS422_RX+(A)	8	N.C
4	RS422_RX-(B)	9	N.C
5	N.C		

## 2.4.8 eDP Connector (CN14)

Pin	Definition	Pin	Definition	Pin	Definition
1	GND	11	GND	21	eDP_HPD
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
6	eDP_TX1+	16	GND	26	BKL_PWR (JP2)
7	GND	17	eDP_AUX-	27	BKL_PWR (JP2)
8	eDP_TX2-	18	eDP_AUX+	28	BKL_PWR (JP2)
9	eDP_TX2+	19	GND	29	BKL_PWR (JP2)
10	GND	20	GND	30	GND

**Note:** For Pins 26-29 BKL\_PWR, please refer to **Ch 2.3.2 Backlight Power (JP2)** for more information.

## 2.4.9 Micro-SD Card Slot (CN18)

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

## 2.4.10 Micro-USB OTG Port (CN21)

---

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

## 2.4.11 Nano-SIM Card Slot (CN22)

---

Pin	Definition	Pin	Definition
C1	USIM_PWR	C5	GND
C2	USIM_RESET	C6	N.C
C3	USIM_CLK	C7	USIM_DATA

## 2.4.12 RTC Battery Connector (CN23)

---

Pin	Definition
1	+3.3V
2	GND

## 2.4.13 DC Power Input (CN25)

---

Pin	Definition
1	GND
2	+12V

## 2.4.14 mPCIe Slot for WWAN Card (CN30)

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

Pin	Definition	Pin	Definition
25	N.C	51	N.C
26	GND	52	+3.3V

### 2.4.15 GPIO Port (CN31)

---

Pin	Definition	Pin	Definition
1	GPIO1_60	6	GPIO6_58
2	GPIO2_56	7	GPIO7_63
3	GPIO3_61	8	GPIO8_59
4	GPIO4_57	9	+3.3V
5	GPIO5_62	10	GND

### 2.4.16 LCD Backlight Connector (CN34)

---

Pin	Definition
1	BKL_PWR (JP2)
2	BKL_CONTROL
3	GND
4	GND
5	BKL_ENABLE

**Note:** For Pin 1 BKL\_PWR, refer to [Ch 2.3.2 Backlight Power \(JP2\)](#) for more information.

## 2.4.17 Speaker Connector (CN35)

Pin	Definition	Pin	Definition
1	GND	6	RIGHT_OUT
2	MIC	7	Spk_L_P
3	HP_DET	8	Spk_L_N
4	GND	9	Spk_R_P
5	LEFT_OUT	10	Spk_R_N

## 2.4.18 MIPI Connector (CN37)

Pin	Definition	Pin	Definition	Pin	Definition
1	TP_VDD_2V8	14	NC	27	GND
2	TP_GND	15	GND	28	MIPI1+
3	TP_RESET	16	GND	29	MIPI1-
4	TP_SCL_1V8	17	LCDID	30	GND
5	TP_SDA_1V8	18	GND	31	MIPI0+
6	TP_INT_1V8	19	MIPI3+	32	MIPI0-
7	NC	20	MIPI3-	33	GND
8	VLED	21	GND	34	GND
9	VLED	22	MIPI2+	35	RESET_1_8V
10	NC	23	MIPI2-	36	LOGIC_1_8V
11	FB1	24	GND	37	VCC_3_3V
12	FB1	25	MIPI_CLK+	38	VCC_3_3V
13	FB1	26	MIPI_CLK-	39	FMARK

## 2.4.19 HDMI 1.4 Port Type A (CN38)

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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		

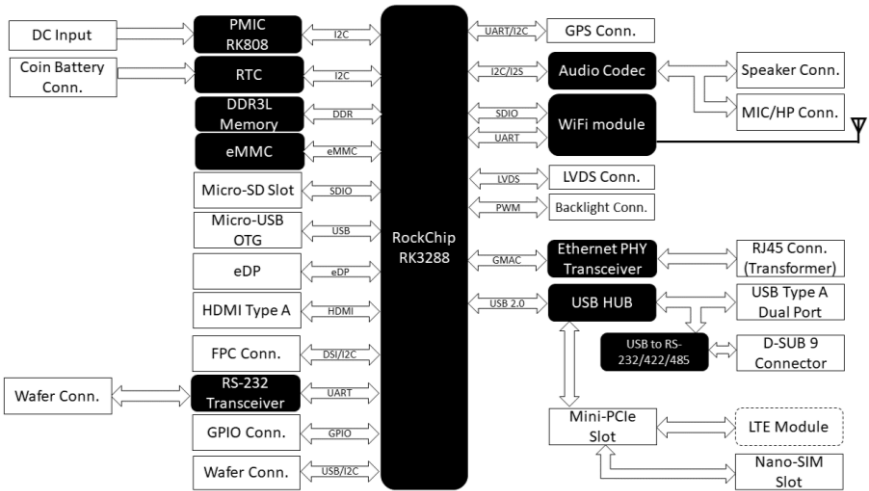
## 2.4.20 RS-232 Connector (CN40)

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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		



## 2.5 Function Block



# Appendix A

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## Mating Connectors

## A.1 List of Mating Connectors and Cables

Connector Label	Function	Mating Connector		Available Cable	Cable P/N
		Vendor	Model no		
CN3	I-PEX Connector for Wi-Fi	I-PEX	20279-001E	RF Coaxial cable	1700010252
CN4	LVDS Connector	PINREX	712-76-30G WE0	N/A	N/A
CN7	Debug Port	PINREX	712-71-09T W01	D-Sub 9 console cable	1701090150
CN8	GbE	SPEEDTECH	RJL4A-4W H1-FP0-0R	N/A	N/A
CN9	Dual USB Port	Techbest	KS-002-AB-L	N/A	N/A
CN11	Integrated USB, I2C x 2, 5V	PINREX	710-H73-09 5WE1	N/A	N/A
CN12	D-Sub 9	Hobase	D-SUB 5m/m-9P	N/A	N/A
CN14	eDP Connector	I-PEX	20455-030E -12	N/A	N/A
CN18	Micro-SD Card Slot	ATTEND	112J-TDAR-R01	N/A	N/A
CN21	Micro-USB OTG Port	TRONTEK	TMC106-US BD05-835	N/A	N/A
CN22	Nano-SIM Card Slot	SUNFUN	SMHN-SO1(01T)	N/A	N/A
CN23	RTC Battery Connector	ACES	50208-0020 1-001	N/A	N/A
CN25	DC Power Input	CATCH	1192-700-02 S	N/A	N/A
CN30	mPCIe Slot for WWAN Card	FOXCONN	AS0B22x-S5 6Q-7H	N/A	N/A
CN31	GPIO Port	PINREX	220-97-05G B01	N/A	N/A
CN34	LCD Backlight Connector	PINREX	721-81-05T W00	N/A	N/A

Connector Label	Function	Mating Connector		Available Cable	Cable P/N
		Vendor	Model no		
CN35	Speaker Connector	PINREX	712-H71-105 W01	N/A	N/A
CN37	MIPI Connector	Panasonic	AYF333135	N/A	N/A
CN38	HDMI 1.4 Port Type A	FOXCONN	QJ51191-LFB 4-7F	N/A	N/A
CN40	RS-232 Connector	PINREX	712-71-09T W01	D-sub9 COM port console cable	1701090150