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# Product Specification

**Item No.:** BTP-PCM-A-022A

**Product Name:** All-in-one Rockchip RK3588 Solution Android Development

Motherboard

**Version :** V

## Version History

Version	Description	Date
V1.0	Established	2021/05/10

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# Index

## **Part 1**

- 1.1: General Product Description
- 1.2: Key Features
- 1.3: Layout and interface Diagram

## **Part 2**

- 2.1: Hardware Specification

## **Part 3**

- 3.1: PCB Size
- 3.2: interface Pin Map Specification

## **Part 4**

- 4.1: Electricity Property

## **Part 5**

- 5.1: Cautions for Assembling

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# Part 1

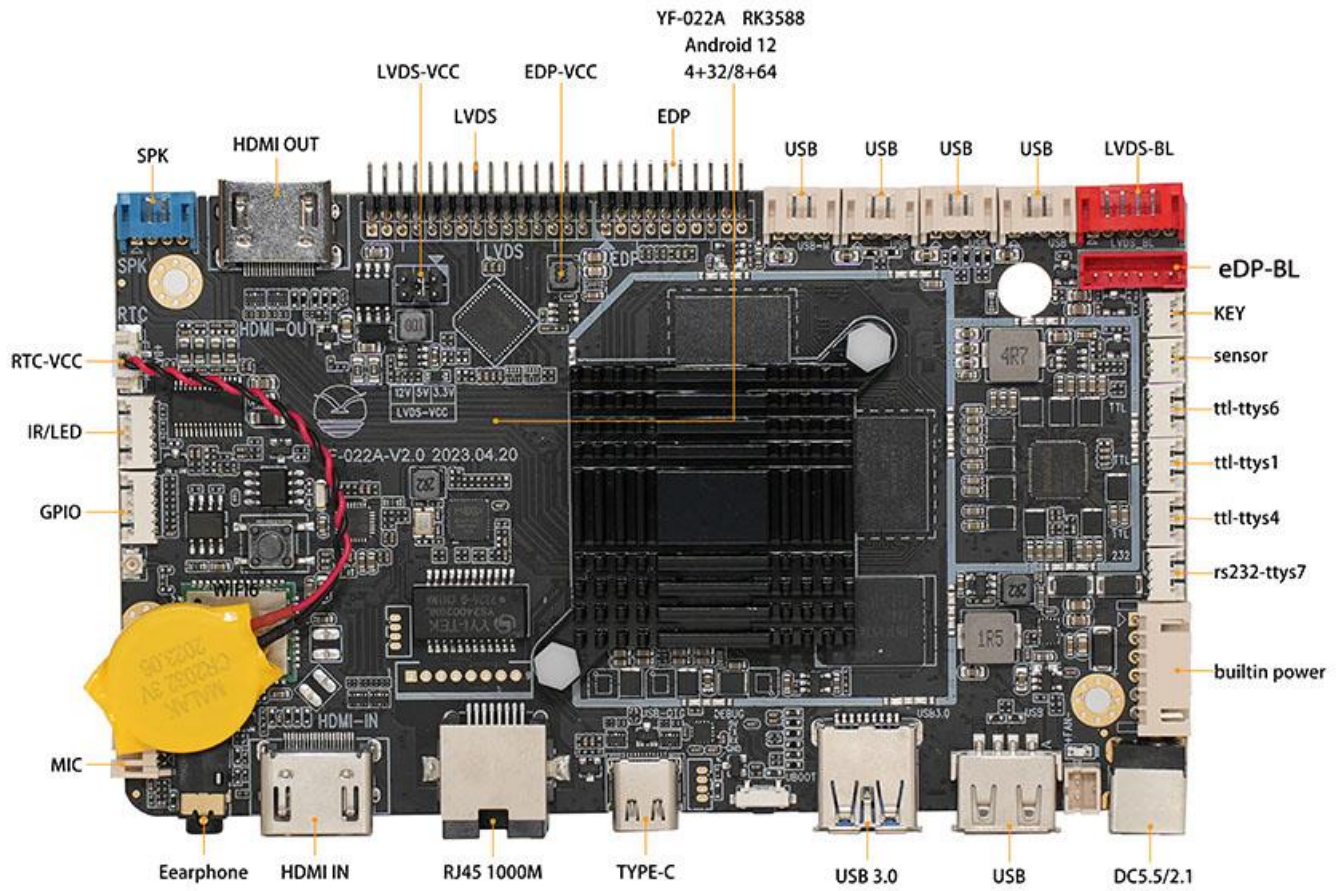
## 1.1 Product Overview

022A board adopts Rockchip RK3588 high-performance, octa-core 64-bit processor (4xA76+4xA55) 8nm LP process technology with a maximum frequency of 2.4GHz, integrated GPU/VPU/NPU ARM Mali-G610 quad-core GPU, VPU 8K@60fps H.265/H.264/VP9 video decoding NPU computing power 6Tops, 8K video codec, clearer images, support Android12.0 system Debian11 and other operating systems. Multi-channel input and output, multi-screen different display, Ethernet, HDMI-IN/OUT, WIFI6, BT5.2 power amplifier integrated, rich expansion interface, simplify the design of the whole machine system, widely used in ARM PC, edge computing, cloud Fields such as servers, smart NVRs, smart large screens, and smart cars .

## 1.2 Key Features

- ◆ High integration. Integrate functions such as USB/LVDS/Gigabit Ethernet/WIFI6/BT5.2/eDP expansion/microphone, etc., simplify the design of the whole machine, and the design of the whole machine is more beautiful.
- ◆ 8K@60fpsH.265/VP9/AVS28K@60fpsH.264/AVC/MVC4K@60fps AV1 and other video encoding and various LVDS/eDP/MIPI signal LCD display.
- ◆ Support HDMI IN/OUT
- ◆ Built-in power amplifier. Support dual channel 8R/5W power amplifier.
- ◆ Rich interfaces. Support USB (2-way USB3.0)/serial port/GPIO/ADC interface expansion, which can meet the mainstream peripherals on the market.
- ◆ Fully functional. Support horizontal and vertical screen playback, video split screen, scrolling subtitles, timer switch, USB data import and other functions.
- ◆ Easy to manage: Humanized playlist making software is convenient for advertising management and control. Play log, easy to understand the playback situation

## 1.3 Layout and interface Diagram





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# Part 2

## 2.1 Hardware Specification

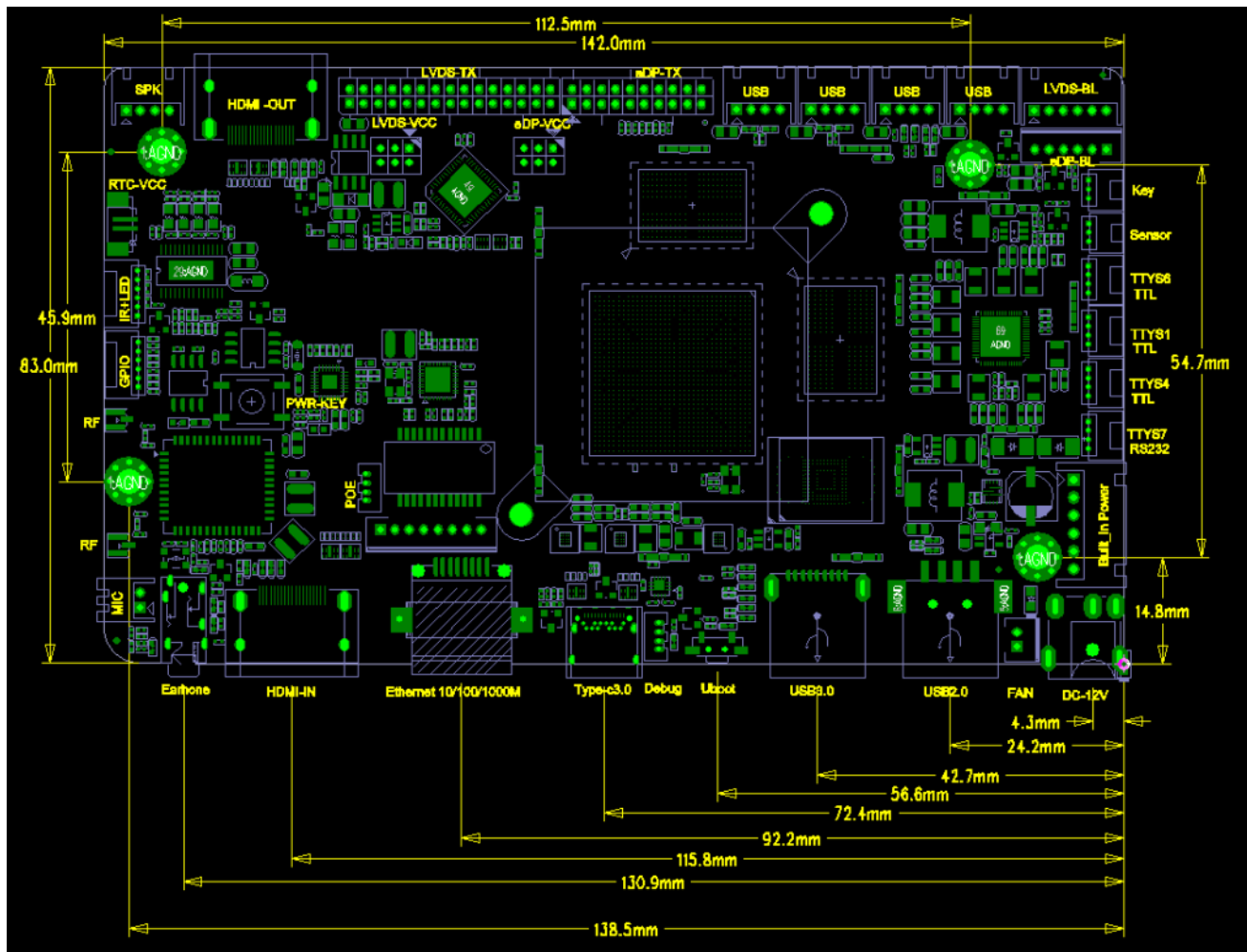
Hardware Spec	
CPU	Rockchip 3588, 8 core (4×Cortex-A76+4×Cortex-A55) 64bit, 8nm advanced tech, main frequency up to 2.4GHz;
GPU	ARM Mali-G610 MP4 quad-core GPU support OpenGL ES3.2 / OpenCL 2.2 / Vulkan1.1, 450 GFLOP
NPU	The NPU computing power is up to 6 TOPS, supports INT4/INT8/INT16 mixed computing, and can realize network model conversion based on TensorFlow / MXNet / PyTorch / Caffe and other series of frameworks
RAM	4GB/8GB/16GB 64bit LPDDR4/LPDDR4x (UP TO 32GB)
ROM	32GB/64GB/128GB eMMC STANDARD 32G
Decoding resolution	Video decoding: 8K@60fps H.265/VP9/AVS2 8K@30fps H.264 AVC/MVC 4K@60fps AV1 1080P@60fps MPEG-2/1/VC-1/VP8 Video encoding: 8K@30fps encoding, support H.265 / H.264 *Up to 32 channels of 1080P@30fps decoding and 16 channels of 1080P@30fps encoding
OS	Android12.0, Linux Debian 11
Type-C	Full Function (except PD)
Play mode	Supports multiple playback modes such as loop, timing, and insertion
Network	Fast Ethernet, support WiFi/BT5.2, wireless peripheral expansion
USB2.0 Ports	1way USB HOST, 4 built-in USB
USB 3.0	1way standard USB 3.0
USB-OTG	USB-OTG Type-c2.0
HDMI out	HDMI2.1 (8K@60fps Or 4K@120fps)
HDMI in	UP To 3840*2160 30HZ
Ethernet	1 way 100M/1000M Adaptive Ethernet
EDP Output	Up to 7680x4320@60Hz
LVDS	Up to 1920*1080
MIPI	Up to 2560*1440
Audio output	Left and right channel output 8R/5W speakers
RTC	support
Hardware watch-dog	support
Timer switch	Support

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Serial port	3 x TTL, 1 x Debug, 1 x RS232
Multi-screen display	Support, up-to three screen display
OS updating	Support TF card/USB
Other function	Automatically import screen parameters through USB/TF

## Part 3

## 3.1 PCB Size



PCB: 6 layers

Size : 135\*90\*1.6mm

Screw hole:  $\phi$  3.5mm x 4

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## 3.2 Interface Pin Map

### 1 BAT1 RTC battery interface (J2)

No.	Definition	property	Description
1	RTC	Input	3.3V Input
2	GND	ground	ground

### 2 LED+IR remote indicator 6P-1.25(CON8)

No.	Definition	property	Description
1	LED-R	red light	关机指示
2	GND	ground	ground
3	LED-G	green light	开机指示
4	IR-VCC	IR-VCC	IR-VCC power
5	GND	ground	ground
6	IR	IRsignal	IRsignal

### 3 TP interface (JP2-10P/0.5 Interval)

No.	Definition	property	Description
1	GND	ground	ground
2	GND	ground	ground
3	RST	Input/output	复位
4	INT	Input/output	中断
5	GND	ground	ground
6	SCL	clock	clock
7	SDA	data	data
8	VCC	power	V3.3 power
9	GND	ground	ground
10	GND	ground	ground

### 4 Serial ports \*3 (CON6/CON7/CON10)TTL

No.	Definition	property	Description
1	VCC-3.3V	output	3.3Voutput
2	UART-TX	Input/output	dataInput/output
3	UART-RX	Input/output	dataInput/output
4	GND	ground	ground

## 5 Serial port (CON5) RS232

No.	Definition	property	Description
1	VCC-5V	output	5Voutput
2	UART-TX	Input/output	dataInput/output
3	UART-RX	Input/output	dataInput/output
4	GND	ground	ground

## 6 Loudspeaker (CON12)

No.	Definition	property	Description
1	OUTL+	output	Audiooutputleft+
2	OUTL-	output	Audiooutputleft-
3	OUTR-	output	Audiooutput 右-
4	OUTR+	output	Audiooutput 右+

## 7 MIC interface (MIC1)

No.	Definition	property	Description
1	MCIN	Input	MICnegative
2	MCIP	Input	MICpositive

## 8 Backlight control interface for eDP (CON1)

No.	Definition	property	Description
1	VCC	power	12Voutput
2	VCC	power	12Voutput
3	BL-EN	output	backlight enable control
4	BL-ADJ	output	背光亮度控制
5	GND	ground	ground
6	GND	ground	ground

## 9 Backlight control interface for LVDS (CON16)

No.	Definition	property	Description
1	VCC	power	12Voutput
2	VCC	power	12Voutput
3	BL-EN	output	backlight enable control
4	BL-ADJ	output	Backlight brightness control
5	GND	ground	ground
6	GND	ground	ground

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**10 I/O interface 6P-1.25(CON2)**

No.	Definition	property	Description
1	VCC	power	3.3Voutput
2	I/O	Input/output	GPIO-1
3	I/O	Input/output	GPIO-2
4	I/O	Input/output	GPIO-3
5	I/O	Input/output	GPIO-4
6	GND	ground	ground

**11 I/O interface 3P-1.25 (CN2)**

No.	Definition	property	Description
1	I/O	Input/output	Sensor
2	GND	ground	ground
3	VCC	power	+5Voutput

**12 Key interface 3P-1.25 (J1)**

No.	Definition	property	Description
1	PWR	switchkey	switchkey
2	ADKey	ADKey	ADKey
3	GND	ground	ground

**13 USB Built-in (CON26,CON13,CON14,CON17)**

No.	Definition	property	Description
1	USB-5V	output	5Voutput
2	DM	Input/output	Data Input/output
3	DP	Input/output	Data Input/output
4	GND	ground	ground

## 14 LVDS interface (CON15)

No.	Definition	property	Description
1	PVCC	poweroutput	Poweroutput to LCD panel, +3.3V/+5V/ +12V optional, setup by adjusting the jumper on CN1
2			
3			
4	GND	ground	ground
5			
6			
7	RX00-	output	Pixel0 Negative Data (Odd)
8	RX00+	output	Pixel0 Positive Data (Odd)
9	RX01-	output	Pixel1 Negative Data (Odd)
10	RX01+	output	Pixel1 Positive Data (Odd)
11	RX02-	output	Pixel2 Negative Data (Odd)
12	RX02+	output	Pixel2 Positive Data (Odd)
13	GND	ground	ground
14	GND	ground	ground
15	RXOC-	output	Negative Sampling Clock (Odd)
16	RXOC+	output	Positive Sampling Clock (Odd)
17	RX03-	output	Pixel3 Negative Data (Odd)
18	RX03+	output	Pixel3 Positive Data (Odd)
19	RXE0-	output	Pixel0 Negative Data (Even)
20	RXE0+	output	Pixel0 Positive Data (Even)
21	RXE1-	output	Pixel1 Negative Data (Even)
22	RXE1+	output	Pixel1 Positive Data (Even)
23	RXE2-	output	Pixel2 Negative Data (Even)
24	RXE2+	output	Pixel2 Positive Data (Even)
25	GND	ground	ground
26	GND	ground	ground
27	RXEC-	output	Negative Sampling Clock (Even)
28	RXEC+	output	Positive Sampling Clock (Even)
29	RXE3-	output	Pixel3 Negative Data (Even)
30	RXE3+	output	Pixel3 Positive Data (Even)

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## 15 MIPI interface (CN1)

Pin	Symbol	Function
1	NC	No connection
2	VDD	Power supply VDDIN=3.3V
3	VDD	Power supply VDDIN=3.3V
4	GND	Groud
5	RESET	Global reset signal(3.3)
6	NC	No connection
7	GND	Groud
8	D0N	0- MIPI Differential data
9	D0P	0+MIPI Differential data
10	GND	Groud
11	D1N	1- MIPI Differential data
12	D1P	1+MIPI Differential data
13	GND	Groud
14	CLKN	-MIPI Differential clock data
15	CLKP	+MIPI Differential clock data
16	GND	Groud
17	D2N	2- MIPI Differential data
18	D2P	2+MIPI Differential data
19	GND	Groud
20	D3N	3- MIPI Differential data
21	D3P	3+MIPI Differential data
22	GND	Groud
23	NC	No connection
24	NC	No connection
25	GND	Groud
26	NC	No connection
27	NC	No connection
28	NC	No connection
29	NC	No connection
30	GND	Groud
31	LED-	LED Cathode
32	LED-	LED Cathode
33	NC	No connection
34	NC	No connection
35	NC	No connection
36	NC	No connection
37	NC	No connection
38	NC	No connection

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39	LED+	LED Anode
40	LED+	LED Anode

## 16 eDP interface (CN11)

Pin No.	Definition	Property	描述
1	PVCC	Power output	LCD Panel Power output, +3.3V R864 3.3V/R865 10V
2	PVCC	Power output	LCD Panel Power output, +3.3V R864 3.3V/R865 10V
3	GND	Ground	Ground
4	GND	Ground	Ground
5	Lane0_n	data output	Complement Signal-Lane0
6	Lane0_p	data output	True Signal-Main Lane0
7	Lane1_n	data output	Complement Signal-Lane1
8	Lane1_p	data output	True Signal-Main Lane1
9	Lane2_n	data output	Complement Signal-Lane2
10	Lane2_p	data output	True Signal-Main Lane2
11	Lane3_n	data output	Complement Signal-Lane3
12	Lane3_p	data output	True Signal-Main Lane3
13	GND	Ground	Ground
14	GND	Ground	Ground
15	AUX_N	data output	Complement Signal-Auxiliary Channel
16	AUX_P	data output	True Signal-Auxiliary Channel
17	GND	Ground	Ground
18	GND	Ground	Ground
19	GND	Ground	Ground
20	HPD	HPD	HPD

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## 17 Other Interface Function:

Storage interface	TF card	Data saving, up to 128GB
	USB	HOST interface support data saving and importing, USB mouse and keyboard camera, touch screen, etc
Ethernet	RJ45 interface	Support wire network
HDMI interface	Standard	Support HDMI output, up to 4K
TF	Standard interface	TF 128G

## Part 4

### 4.1 Electricity property

Item		min	classic	Max
Power Voltage	Voltage	--	12	--
	Wave	--	--	50mV
Current (HDMI output, no other output)	Work current	--	250mA	300mA
	Standby current	--	32mA	70mA
	USB current supply	--	--	500mA
	Current to Panel	--	--	1A
enviroment	Relative Humidity	--	--	80%
	Temperature	-20℃	--	70℃

Remark 1: When connecting to an LVDS screen, care should be taken to select the correct backlight operating voltage of 3.3V, 5V, 12V, and users should not apply it to peripherals that exceed the corresponding maximum current.

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# Part 5

## 5.1: Cautions for Assembling

- During assembly and use, please pay attention to the following (and not limited to) problems.
- Short circuit problem between bare board and peripherals.
- during the installation and fixation process, avoid deformation problems of the bare board due to fixation.
- To install the LVDS LCD Panel, pay attention to whether the LCD Panel Voltage and current are correct. Pay attention to the direction of pin 1 of the LCD Panel Interface.
- To Install the LVDS LCD Panel, pay attention to whether the LCD Panel backlight Voltage and current are correct. When LCD Panel backlight power is above 20W, please use external Power boards for power supply.
- To Install peripherals (USB, IO), pay attention to the peripheral IO level and current Output issues.
- To Install Device to the serial port, pay attention to whether the RS232, 485 device is directly connected, and whether the TX and RX connected correctly.
- Check whether Input Power is connected to the Power Input interface. check whether Power Voltage and current meet the requirements, according to the total peripheral evaluation
- It is forbidden to connect the power supply to the backlight socket for the convenience of operation.