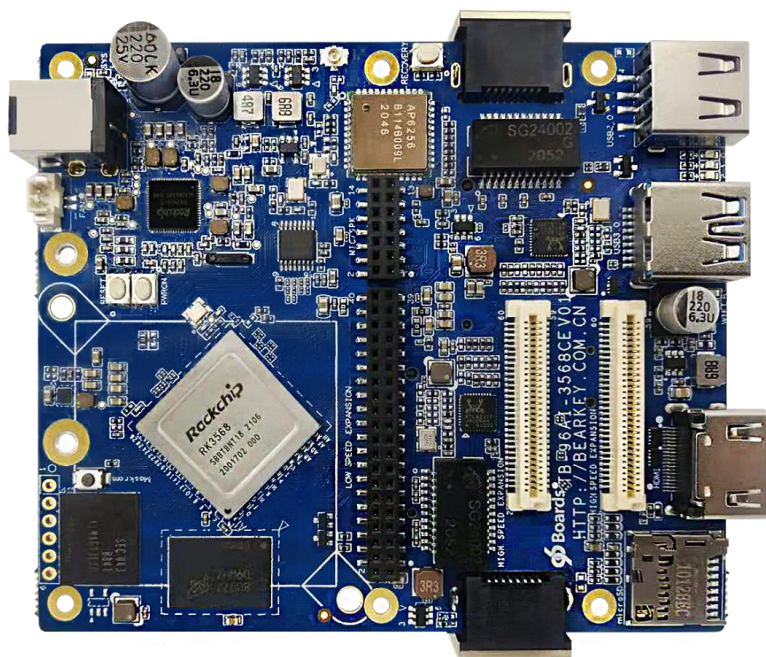


96Boards CE RK3568 Development board

product user manual

V1.1



Revision History

Version Number	Revision Time	Revised Content	Reviser
V1.0	20210320	Create for the first time	kewf
V1.0	20210421	Update product photo	Luowz

1. Product Overview

TB-96AI-3568CE Development Board is a Linaro 96Boards CE HW Specification V2.0 Development Board based on Rockchip artificial intelligence chip rk3568 developed by BeiQi Technology.

Rockchip RK3568 chip is a general-purpose SOC with high-end positioning. It adopts 22nm process technology, integrates 4-core arm architecture A55 processor and Mali G52 2ee graphics processor, and supports 4K decoding and 1080p coding. Rk3568 supports various types of peripheral interfaces such as SATA / PCIe / USB3.0, and has built-in independent NPU, which can be used for lightweight AI applications. Rk3568 supports Android 11 and Linux system, and is mainly oriented to the customized market of Internet of things gateway, NVR storage, industrial control panel, industrial detection, industrial control box, karaoke, cloud terminal, vehicle central control and other industries.

Tb-96ai-3568ce development board is small in size (85mm × 100mm), powerful in performance, rich in interfaces, and open source in data. It is convenient for secondary development and integration into various products.

1.1. Hardware Parameters

CPU <ul style="list-style-type: none">● RK3568 of Rockchip● Quad-core Cortex-A55 up to 2.0GHz GPU <ul style="list-style-type: none">● Mali-G52 NPU <ul style="list-style-type: none">● 0.8 Tops, support INT8/ INT16 Multi-Media <ul style="list-style-type: none">● Support 4K 60fps	M.2 Connector <ul style="list-style-type: none">● M.2 Connector1: PCIe2.0 or Sata on M.2 connector● M.2 Connector2: 4G LTE/5G Module on M.2 connector External Connector <ul style="list-style-type: none">● Gigabit Ethernet×2 (RJ45)● USB2.0 HOST×1 (TypeA)● USB3.0 OTG ×1 (TypeA)● HDMI2.0 OUT×1
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H.265/H.264/VP9 video encoding ● Support 1080p 100fps h.265/h.264 video decoding ● Support 8M ISP ● Support HDR	● Micro SD×1 ● DC12V IN×1 (5.5mm*2.5mm) ● SIM CARD×1
Memory ● RAM 2GB LPDDR4 ● Storage 16GB eMMC Support micro SD extension	ADC ● ADC×5
	Debug ● Debug MicroUSB
WiFi/BT ● 2.4GHz & 5GHz IEEE 802.11a/b/g/n/ac ● Bluetooth V4.1 ● WIFI/BT ANT×1	Row Connectors ● One 40-pin Low Speed (LS1) expansion connector 40PIN(UARTx2, SPI, I2S, I2Cx2, GPIO x13, DC power (12V, 5V, 1.8V)) ● One 14-pin LOW Speed(LS2)expansion connector (SPK,MIC,PHONE) ● One 60-pin High Speed(HS1) expansion connector1 60PIN(MIPI DSI/LVDS, USB HOST, 4LINE MIPI CSI) ● One 60-pin High Speed(HS2) expansion connector2 60PIN(PCIe3.0, eDP, TP (I2C, GPIO))
LEDs ● 4×User LEDs ● WiFi LED ● BT LED	
FAN Connector ● FAN Connector×1 (5V or 12V)	
Key ● Power ON/OFF ● RESET ● Recovery	Physical & Operating Characteristics ● Dimension:85mm*100mm ● Number of Layers:8 Layers ● Operating Temperature:0°C to +55°C ● Qualification certification:NA

1.2. Software Parameters

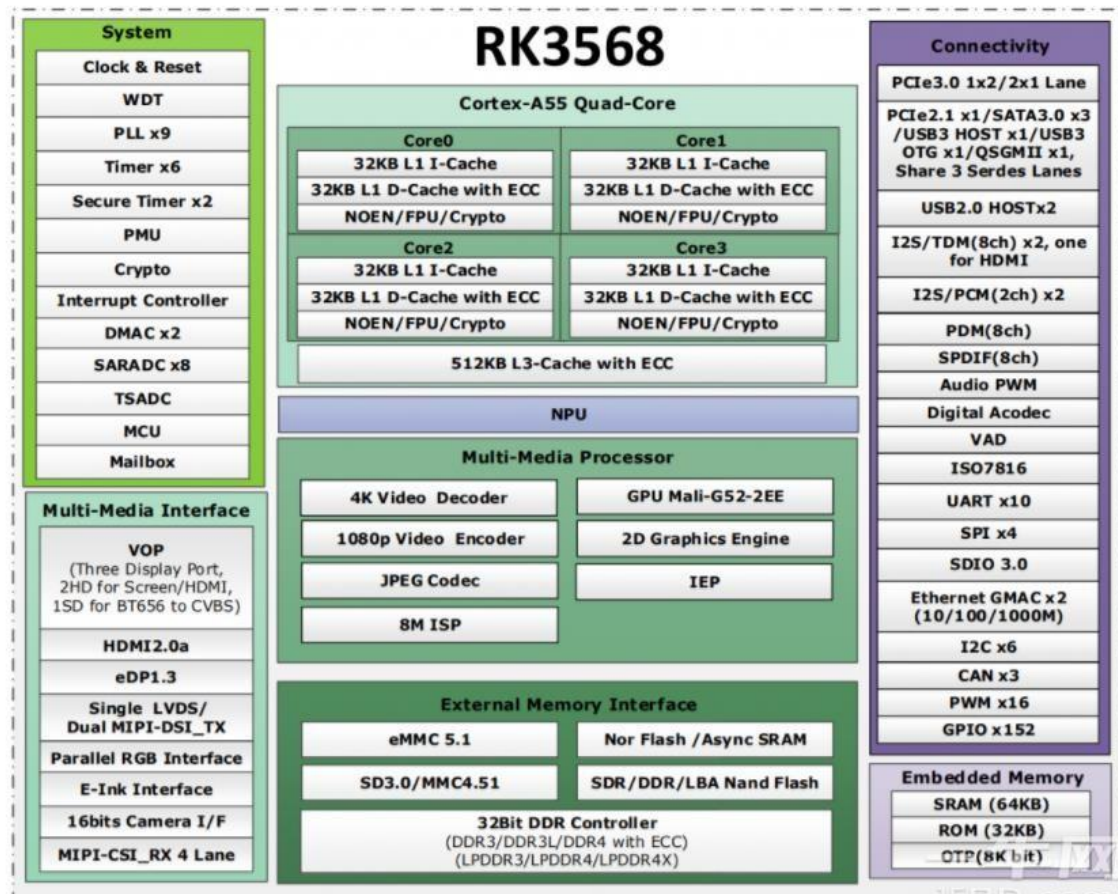
System Support <ul style="list-style-type: none">● Android11● Debian● Linux+QT	AI Application Development <ul style="list-style-type: none">● Supports 8bit/16bit operations with AI up to 2.0TOPs;● High computing power at full load and low power consumption at light load;● Compatible with Caffe/Mxnet/TensorFlow model, supports multiple frameworks, supports mainstream layer types, and is easy to add custom layers;● The AI application development SDK supports C/C++ and Python, facilitates the conversion and debugging of floating-point to fixed-point network for customers, and is extremely convenient for development.
DEMO <ul style="list-style-type: none">● NVR network storage server● E-Reader● Tablet computer● Industrial Control● Smart home control center	

1.3. RK3568 SoC Introduction

Rk3568 follows the update iteration of arm architecture, adopts A55 architecture and G52 graphics processor to continuously improve the product performance, and adopts 22nm advanced technology, which can effectively improve the performance of energy consumption. Rk3568 has excellent compatibility with DDR particles. Support LP4 / LP4x / LP3 / DDR4 / DDR3, maximum frequency 1600MHZ, maximum capacity 8GB, DDR3 and DDR4, 2-chip mode, maximum capacity 8GB, DDR3 and DDR4 ECC.

Rk3568 has rich function expansion interfaces, which can effectively improve the expansibility of industry customization. Rk3568 supports pcie3.0 1 × 2 / 2x1lanes and

pcie2.1 1x1lane, meeting the expansion requirements of 4G / 5G, WiFi 6, multi port, NPU, etc. Rk3568 supports 3x sata3.0, which solves various instability problems of traditional AP processor's USB extension SATA. It supports up to four USB ports, 1xusb3.0 / USB2.0 host + 1xusb3.0 / USB2.0 OTG + 1xusb2.0 host + 1xusb2.0 host. Support dual Gigabit Ethernet port, and support qsgmii to reduce the occupation of IO port, to meet the needs of industrial control and Internet of things gateway.



Rk3568 is equipped with 4-core cortex-a55 CPU, g52gpu and NPU of 0.8tops. The software interface suite is friendly in design. According to the practice of NVR industry platform, multimedia processing API is packaged according to module. Customer application software can be rapidly developed and imported into AI / AO / VO / vdec / Venc.

Rk3568 has the following eight advantages:

- 1) It supports 10 channels of 1080p30 video decoding and 8 channels of video coding;
- 2) Support Tso / UFO hardware acceleration, effectively reduce CPU load; at the same

time, powerful CPU performance, improve the access ability of webcam;

3) Built in independent third-generation NPU hardware accelerator, with a performance of 0.8-1tops; support face comparison, face search, alarm, human car classification, 4-5-way intelligent detection; support one click conversion, support Caffe / tensorflow / TF LITE / onnx / pytorch / keras / Darknet mainstream architecture model;

4) Rich display interface: support dual / three screen display, hdmi2.0b, output 4K image quality; support EDP / Mipi DSI / LVDS / rgb888 / bt.1120/bt.656;

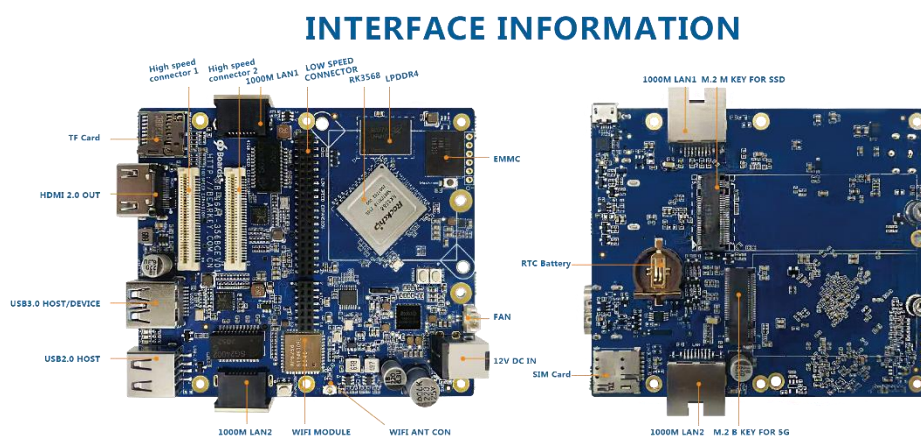
5) Powerful post-processing: support 3D-LUT / gamma / CSC / bcsh / dither / CABG; support image post-processing, denoising, color enhancement;

6) Strong coding ability: support 4K h.264/h.265/vp9 multi format HD decoding; support ROI coding;

7) Compatible with rich DDR particles, support LP4 / lp4x / LP3 / DDR4 / DDR3, support DDR3 and DDR4 ECC, meet the high reliability requirements of industrial control and other scenes, 32bit wide, maximum frequency 1600MHZ, abundant bandwidth design, more able to meet the requirements of security intelligent NVR / xvr scenes;

8) Rich peripheral interfaces: support 3xsata3.0, dual Gigabit network ports, Tso technology, dual PCI, meet the expansion requirements of 4G / 5G / WiFi 6, multi network ports and NPU;

1.4. Interface Description



40-pin Low Speed (LS) expansion connector			
PIN NO.	Signal Name	PIN NO.	Signal Name
1	GND	2	GND
3	UART8_CTSN_M0	4	GPIO4_A5_D
5	UART8_TX_M0	6	GPIO4_B7_D
7	UART8_RX_M0	8	SPI3_CLK_M0
9	UART8_RTSN_M0	10	SPI3_MISO_M0
11	UART7_TX_M2	12	SPI3_CS0n_M0
13	UART7_RX_M2	14	SPI3_MOSI_M0
15	I2C3_SCL_M0	16	I2S3_LRCK_M1 (PCM_FS)
17	I2C3_SDA_M0	18	I2S3_SCLK_M1 (PCM_CLK)
19	I2C2_SCL_M1	20	I2S3_SDO_M1 (PCM_DO)
21	I2C2_SDA_M1	22	I2S3_SDI_M1 (PCM_DI)
23	GPIO1_D4_u	24	GPIO4_C2_d
25	GPIO1_A4_d	26	GPIO4_A0_d
27	GPIO1_B0_d	28	LCD_BL_PWM4_1V8
29	GPIO1_B2_d	30	GPIO4_A4_d
31	GPIO1_B1_d	32	GPIO4_A7_d
33	GPIO1_A1_d	34	GPIO4_B1_D
35	VCC1V8_EXT	36	VCC12V_DCIN
37	VCC5V0_SYS	38	VCC12V_DCIN
39	GND	40	GND

14-pin Low Speed (LS2) expansion connector			
PIN NO.	Signal Name	PIN NO.	Signal Name
1	SPK_OUTP	2	HPR_OUT

3	SPK_OUTN	4	HPL_OUT
5	GND	6	HP_DET_H
7	MIC_L	8	VCC5V0_SYS
9	MIC_R	10	VCC12V_DCIN
11	MiC_BIAS	12	VCC12V_DCIN
13	GND	14	GND

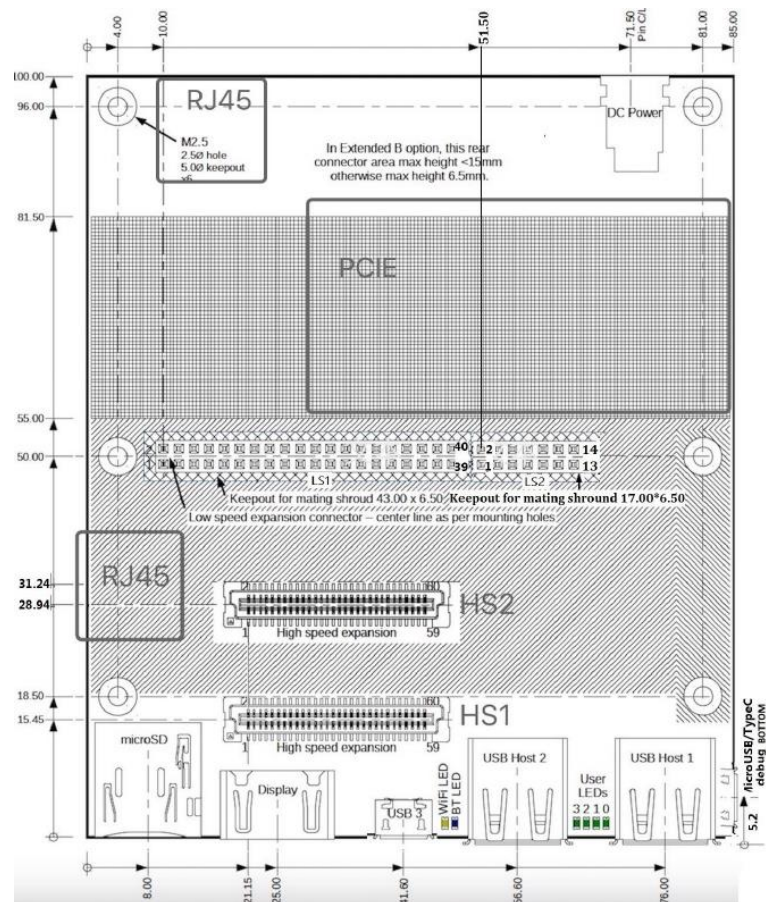
60-pin High Speed (HS1) expansion connector			
PIN NO.	Signal Name	PIN NO.	Signal Name
1	NA	2	MIPI_CSI_RX_CLKOP
3	NA	4	MIPI_CSI_RX_CLKON
5	NA	6	GND
7	NA	8	MIPI_CSI_RX_D0P
9	NA	10	MIPI_CSI_RX_D0N
11	NA	12	GND
13	GND	14	MIPI_CSI_RX_D1P
15	MIPI_CSI_MCLK0	16	MIPI_CSI_RX_D1N
17	MIPI_CSI_MCLK0	18	GND
19	GND	20	MIPI_CSI_RX_D2P
21	MIPI_DSI_TX0_CLKP/LVDS_TX0_CLKP	22	MIPI_CSI_RX_D2N
23	MIPI_DSI_TX0_CLKN/LVDS_TX0_CLKN	24	GND
25	GND	26	MIPI_CSI_RX_D3P
27	MIPI_DSI_TX0_D0P/LVDS_TX0_D0P	28	MIPI_CSI_RX_D3N
29	MIPI_DSI_TX0_D0N/LVDS_TX0_D0N	30	GND

31	GND	32	NA
33	MIPI_DSI_TX0_D1P/LVDS_TX0_D1P	34	NA
35	MIPI_DSI_TX0_D1N/LVDS_TX0_D1N	36	NA
37	GND	38	NA
39	MIPI_DSI_TX0_D2P/LVDS_TX0_D2P	40	GND
41	MIPI_DSI_TX0_D2N/LVDS_TX0_D2N	42	NA
43	GND	44	NA
45	MIPI_DSI_TX0_D3P/LVDS_TX0_D3P	46	GND
47	MIPI_DSI_TX0_D3N/LVDS_TX0_D3N	48	NA
49	GND	50	NA
51	HUB2_HOST3_DP3	52	GND
53	HUB2_HOST3_DM3	54	MIPI_CSI_RX1_CLK1P
55	GND	56	MIPI_CSI_RX1_CLK1N
57	NA	58	GND
59	NA	60	NA

60-pin High Speed (HS2) expansion connector			
PIN NO.	Signal Name	PIN NO.	Signal Name
1	PCIE30X2_PERSTn	2	EDP_TX_AUXP
3	CLK0P_CON	4	EDP_TX_AUXN
5	CLK0N_CON	6	GND
7	PCIE30_RX0P	8	EDP_TX_D0P

9	PCIE30_RX0N	10	EDP_TX_D0N
11	PCIE30_TX0P	12	GND
13	PCIE30_TX0N	14	EDP_TX_D1P
15	GND	16	EDP_TX_D1N
17	PCIE30_RX1P	18	GND
19	PCIE30_RX1N	20	EDP_TX_D2P
21	PCIE30_TX1P	22	EDP_TX_D2N
23	PCIE30_TX1N	24	GND
25	GND	26	EDP_TX_D3P
27	NA	28	EDP_TX_D3N
29	NA	30	GND
31	GND	32	TP_INT
33	NA	34	TP_RST
35	NA	36	I2C1_SCL_TP
37	GND	38	I2C1_SDA_TP
39	NA	40	GND
41	NA	42	NA
43	GND	44	EDP_PWREN_H
45	NA	46	EDP_BL_PWM
47	NA	48	PCIE30X2_CLKREQn
49	GND	50	PCIE30X2_WAKEn
51	NA	52	NA
53	NA	54	NA
55	GND	56	GND
57	NA	58	NA
59	NA	60	NA

1.5. Assembly Dimensions



1.6. Scenarios

TB-96AIoT-1126CE development boards can be widely used in different fields, typical applications include:

- Consumer electronics
- Medical Electronics
- Internet of things
- Artificial intelligence
- Machine learning
- Face recognition terminal
- Network AI camera
- Digital signs
- E-Reader

- Tablet computer
- Smart home control center
- NVR Networked storage server

2. Instructions for use

<p>1 USB cable to Dubug</p> <ul style="list-style-type: none"> ➤ Connect the Micro-USB end of the USB cable to the debug port and TypeA-USB to the computer host. ➤ Open the serial port tool of the host computer and apply the following configuration: baud rate: 1500000 Data bits: 8 Stop Bit: 1 Parity Check: NA flow control: NA 	<p>4 Connect mouse and keyboard (optional)</p> <ul style="list-style-type: none"> ➤ Insert a USB mouse and USB keyboard to the USB port of the development board ➤ Mouse and keyboard to watch/track on HDMI display
<p>2 Connect HDMI cable (optional)</p> <p>Connect one end of the HDMI cable to the development board HDMI port and the other end to a display that supports HDMI.</p>	<p>5 Connect LTE module (optional)</p> <ul style="list-style-type: none"> ➤ Insert LTE/5G module into M.2 port ➤ Insert SIM card at the same time <p>6 Connect a USB-OTG cable (optional)</p> <p>When firmware needs to be re burned, plug micro USB port of USB data cable into USB OTG port of development board, and typea USB at the other end to computer host</p>
<p>3 Connect to Ethernet (optional)</p> <p>Plug wired Ethernet into RJ45 ports of the development board</p>	<p>7 Connect DC12V power cord (power on)</p> <p>Connect the 12V power plug, and when the power supply is connected, the development board starts automatically.</p>