

BPI-H618 pre-edit

A Banana Pi SBC for embedded applica

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Chapter 1. Introduction

1.1 Introduction

The BPI-H618 development board stands as a powerful Single Board Computer (SBC), harnessing the capabilities of the Allwinner H618 System-on-Chip (SoC) to provide developers with impressive performance and a wealth of features. Similar to the Raspberry Pi 4b, the BPI-H618 boasts comparable CPU prowess, LPDDR4 memory support, integrated WiFi and Bluetooth functionalities, and a familiar 40-pin header layout, alongside 4 USB interfaces and a GbE RJ45 port.

It not only features a standard SD card slot for operating systems but also integrates a high-performance 8GB eMMC flash memory. This enhancement brings forth significantly accelerated system read and write speeds, expediting development and debugging processes, thereby furnishing a more stable and efficient foundation for project endeavors.

One of the flagship traits of the BPI-H618 development board is its exceptional imaging and decoding capabilities. Equipped with a full-size HDMI 2.0a interface, it supports 4K resolution output at refresh rates of up to 60Hz. This empowers users with remarkable decoding capabilities, accommodating various video formats, including but not limited to, H.265 4K@60fps, 6K@30fps, VP9 4K@30fps, AVS2 4K@60fps, and H.264 4K@30fps. Furthermore, the BPI-H618 also boasts H.264 4K@25fps encoding performance, rendering it an ideal choice for applications encompassing streaming, entertainment, and visual processing.

The BPI-H618's design flexibility makes it well-suited for diverse application scenarios within the hardware realm. Its Raspberry Pi-compatible 40-pin header facilitates seamless interfacing with a variety of sensors, expansion boards, and devices. Moreover, the availability of 4 USB interfaces facilitates connection to external peripherals, further extending its utility. The GbE RJ45 interface offers expedient high-speed network connectivity, positioning the BPI-H618 as an optimal selection for networking applications and Internet of Things (IoT) projects.

The BPI-H618 development board, characterized by its robust performance, versatile features, and remarkable image processing capabilities, stands as an exemplary SBC development platform for professionals within the embedded and computing industries. Equipped with 8GB eMMC flash storage, high-performance decoding and encoding capabilities, and an array of interface options, it caters to a wide spectrum of application domains, including media processing, IoT, and entertainment. Whether catering to novices or seasoned developers, the BPI-H618 development board offers an ideal toolset for realizing creative visions and project objectives.

1.2 Features

Hardware and Interface

- Allwinner H618, Quad-core ARM Cortex™-A53 processor, 64-bit, up to 1.5GHz
- 32KB L1 I-cache + 32KB L1 D-cache per core and 1MB L2 cache
- ARM Mali G31 GPU
- WIFI & Bluetooth
- 2G LPDDR4 RAM
- 8G eMMC flash memory
- 1x MicroSD card slot
- 1x USB2.0 Type-C OTG, 5V power supply
- 4x USB2.0 Type-A
- 1x HDMI 2.0a
- 1x 3.5mm Audio & TVE slot
- 1x GbE Ethernet port (supports PoE with add-on PoE HAT)
- 1x Debug UART
- 40-pin header, 28-pin GPIO
 - UART, SPI, TWI/I²C, PWM, PCM/I²S
- 1x CIR

Decoder and Encoder

Decoder

- H.265 Main10@L5.1 up to 4K@60fps, or 6K@30fps
- VP9 Profile 2 up to 4K@ 30fps
- AVS2 JiZhun 10bit Profile up to 4K@ 60fps
- H.264 BP/MP/HP@L4.2 up to 4K@30fps

Encoder

- Maximum 16-megapixel (4096x 4096) resolution for H.264 encoding
- H.264 encoding capability: 4K@25fps
- JPEG snapshot performance of 1080p@60fps independently
- Supports the constant bit rate (CBR)/variable bit rate (VBR) bit rate control mode, ranging from 256 kbit/s to 100Mbit/s

Chapter 2. Mechanical Specification

Chapter 3. Peripherals

3.1 GPIO Interface

The BPI-H618 makes 28 H618 GPIOs available via a standard 2.54mm pitch 40-pin header.

3.1.1 GPIO Pin Assignments

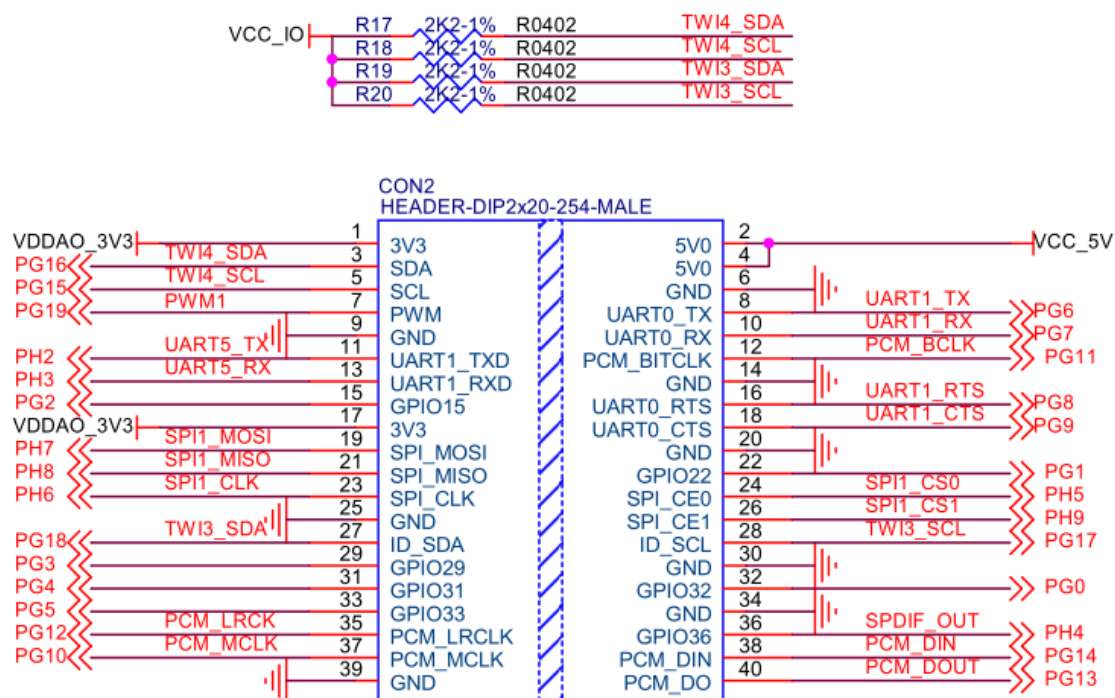


Figure 1. 40-pin header schematic

In addition to their utility for basic software-controlled input and output operations, which includes programmable pull functionalities, GPIO pins possess the capability to be reconfigured (multiplexed) into diverse operational modes supported by specialized peripheral blocks such as TWI/I2C, UART, and SPI.

3.1.2 GPIO Alternate Functions

Pin Num: The number among the 40-pin header.

Pin Name: The name of the pin.

Ball Reset State: The state of the terminal at reset. PU: pull up; PD: pull down; Z: high impedance.

Table 1. GPIO Alternative Function Assignments

Pin Num	Pin Name	Ball Reset State	ALT0	ALT1	ALT2	ALT3
1	3.3V					
2	5V					
3	PG16	PU	UART2_RX			TWI4_SDA
4	5V					
5	PG15	PU	UART2_TX			TWI4_SCK
6	GND					
7	PG19	Z			PWM1	
8	PG6	Z	UART1_TX			
9	GND					
10	PG7	Z	UART1_RX			
11	PH2	Z	UART5_TX		PWM2	
12	PG11	Z	H_I2S2_BCLK			
13	PH3	Z	UART5_RX		PWM1	
14	GND					
15	PG2	PU				
16	PG8	Z	UART1_RTS			
17	3.3V					
18	PG9	Z	UART1_CTS			
19	PH7	Z	UART2_RTS	H_I2S3_LRC K	SPI1_MOSI	
20	GND					
21	PH8	Z	UART2_CTS	H_I2S3_DO UT0	SPI1_MISO	H_I2S3_DIN 1
22	PG1	PU				

Pin Num	Pin Name	Ball Reset State	ALT0	ALT1	ALT2	ALT3
23	PH6	Z	UART2_RX	H_I2S3_BCLK	SPI1_CLK	
24	PH5	Z	UART2_TX	H_I2S3_MCLK	SPI1_CS0	
25	GND					
26	PH9	Z		H_I2S3_DIN0	SPI1_CS1	H_I2S3_DO UT1
27	PG18	PU	UART2_CTS			TWI3_SDA
28	PG17	PU	UART2_RTS			TWI3_SCK
29	PG3	PU				
30	GND					
31	PG4	PU				
32	PG0	Z				
33	PG5	PU				
34	GND					
35	PG12	Z	H_I2S2_LCLK			
36	PH4	Z				
37	PG10	Z	H_I2S2_MCLK			
38	PG14	Z	H_I2S2_DIN0	H_I2S2_DO UT1		
39	GND					
40	PG13	Z	H_I2S2_DO UT0	H_I2S2_DIN1		

3.1.3 Detailed Signal Description

Signal Name: The name of every signal.

Description: The detailed function description of every signal.

Type: Denotes the signal direction:

- I (Input)
- O (Output)
- I/O(Input/Output)

Table 2. Detailed Signal Description

Signal Name	Description	Type
UART[1/2/5]_TX	UART[1/2/5] Data Transmit	O
UART[1/2/5]_RX	UART[1/2/5] Data Receive	I
UART[1/2]_CTS	UART[1/2] Data Clear to Send	I
UART[1/2]_RTS	UART[1/2] Data Request to Send	O
SPI1_CS0	SPI1 Chip Select0 Signal, Low Active	I/O
SPI1_CS1	SPI1 Chip Select1 Signal, Low Active	I/O
SPI1_CLK	SPI1 Clock Signal	I/O
SPI1_MOSI	SPI1 Master Data Out, Slave Data In	I/O
SPI1_MISO	SPI1 Master Data In, Slave Data Out	I/O
TWI[3/4]_SCK	TWI[3/4] Serial Clock Signal	I/O
TWI[3/4]_SDA	TWI[3/4] Serial Data Signal	I/O
PWM[1/2]	Pulse Width Modulation Output Channel [1/2]	I/O
H_I2S[2/3]_MCLK	I2S[2/3] Master Clock	O
H_I2S[2/3]_LRCK	I2S[2/3]/PCM[2/3] Sample Rate Clock/Sync	I/O
H_I2S[2/3]_BCLK	I2S[2/3]/PCM[2/3] Sample Rate Clock	I/O
H_I2S[2/3]_DOUT[1/2]	I2S[2/3]/PCM[2/3] Serial Data Output Channel [1/2]	O

Signal Name	Description	Type
H_I2S[2/3]_DIN[1/2]	I2S[2/3]/PCM[2/3] Serial Data Input Channel [1/2]	I

3.2 Debug UART

Provide a Debug UART via a separate 2.54mm pitch 3-pin header, with TX、RX and GND.

The default baud rate is **115200 bps**.

3.3 USB 2.0 OTG & Power Supply

The board requires a good quality USB Type-C power supply capable of delivering 5V@3A.

If attached downstream devices consume less than 500mA or none device, a 5V@2A supply may be used.

The USB Type-C sockets provide USB 2.0 OTG, with integrated USB 2.0 analog PHY.

Compatible with USB 2.0 Specification.

Supports High-Speed (HS, 480 Mbit/s), Full-Speed (FS, 12 Mbit/s) and Low-Speed (LS, 1.5 Mbit/s) in host mode.

Supports High-Speed (HS, 480 Mbit/s), Full-Speed (FS, 12 Mbit/s) in device mode.

Compatible with Enhanced Host Controller Interface (EHCI) Specification, Version 1.0, and the Open Host Controller Interface (OHCI) Specification, Version 1.0a for host mode.

Up to 8 User-Configurable Endpoints (EPs) for Bulk, Isochronous and Interrupt bi-directional transfers.

Supports (4KB+64Bytes) FIFO for all EPs (including EP0).

Supports point-to-point and point-to-multipoint transfer in both host and peripheral mode.

3.4 USB 2.0 HOST

Provide 4 USB 2.0 Type-A sockets through the onboard USB HUB.

Compatible with Enhanced Host Controller Interface (EHCI) Specification, Version 1.0, and the Open Host Controller Interface (OHCI) Specification, Version 1.0a.

Supports High-Speed (HS, 480 Mbit/s), Full-Speed (FS, 12 Mbit/s) and Low-Speed (LS, 1.5 Mbit/s) device.

Provide another USB 2.0 host port via a separate 2.54mm pitch 2-pin header, supports USB standby.

3.5 Micro SD card

Provide a Micro SD card slot, 4-bit bus width, support SD3.0.

3.6 CIR

Provide a Consumer Infrared Receiver.

Supports NEC format infrared data.

Supports CIR for remote control or wireless keyboard.

3.7 HDMI

Provides a full-size HDMI2.0a port. Compatible with HDCP 2.2 and HDCP 1.4, supports DDC and SCDC, integrated CEC hardware engine.

Video support:

- 2D Video: 4K/1080P/1080I/720P/576P/480P/576I/480I, up to 4K@60fps
- -3D Video: 4K/1080P/720P/576P/480P, up to 4K@30fps
- Supports RGB888/YUV444/YUV422 output
- Color depth: 8/10-bit
- HDR10: compliant with CTA-861.3 and SMPTE ST 2048

Audio support:

- Uncompressed audio formats: IEC60985 L-PCM audio samples, up to 192 kHz
- Compressed audio formats: IEC61937 compressed audio, up to 1536 kHz

3.8 Audio & TVE

Provides a 3.5mm jack socket for Audio & TVE .

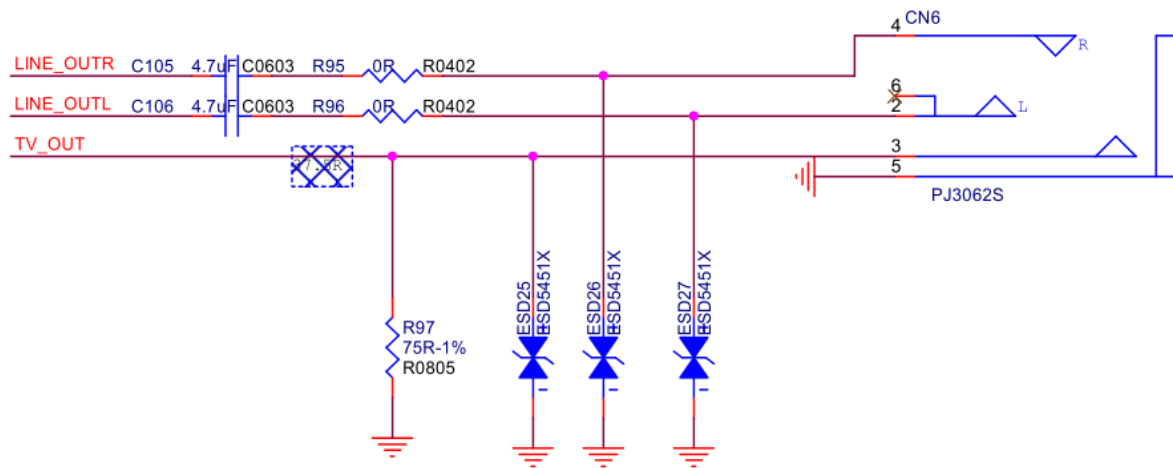


Figure 2. Audio & TVE jack socket schematic

One single-ended LINEOUTL/R audio output.

Two audio digital-to-analog (DAC) channels.

Supports 16-bit and 20-bit sample resolution.

8 kHz to 192 kHz DAC sample rate.

95±2dB SNR@A-weight, -80±3dB THD+N, output Level more than 0.55Vrms.



Figure 3. 3.5mm To 3 RCA Cable

Use 3.5mm To 3 RCA Cable to get the TV CVBS output.

Supports NTSC and PAL mode, plug status auto detecting.

3.9 Buttons

RESET Button, reset when pressed.

FEL Button, boot select button, when press it and hold it down, then reset the board, the board will enter into the mandatory upgrade process.

USER Button, user-programmable button, when pressed, GPIO PC7 will get low level, otherwise it will get a high level.

All buttons are equipped with ESD electrostatic protection.

3.10 Ethernet

Provides a Gigabit Ethernet RJ45 port.

Compliant with IEEE 802.3-2002 standard.

Supports both full-duplex and half-duplex operation.

Supports PoE with add-on PoE HAT.

3.11 WiFi & Bluetooth

Provides 2.4G/5G WiFi and Bluetooth 4.2 via an WIFI+BT Combo Module.

Connect the antenna via IPEX-1 RF connector.

- 2.4G WIFI: 2.412~2.472GHz
- 5G WIFI: 5.18 ~ 5.24GHz / 5.745 ~ 5.825GHz
- BT: 2.402~2.48GHz
- IEEE 802.11a/b/g/n/ac(1T1R)
- Wireless data rate can reach up to 433.3Mbps
- Bluetooth Low Energy Support