

# BananaPi R2 Pro

<https://forum.banana-pi.org/t/banana-pi-bpi-r2-pro-smart-router-board-with-rockchip-rk3568-chip/12522>

[http://wiki.banana-pi.org/Banana\\_Pi\\_BPI-R2\\_Pro](http://wiki.banana-pi.org/Banana_Pi_BPI-R2_Pro)

Official uboot/kernel: <https://github.com/BPI-SINOVOIP/BPI-R2PRO-BSP>

Informations about boot-chain: [http://opensource.rock-chips.com/wiki\\_Boot\\_option](http://opensource.rock-chips.com/wiki_Boot_option)

## hardware

- Rockchip RK3568 Quad-core ARM Cortex-A55 CPU [TRM \(Technical Reference Manual\)](#)
- Rockchip RK809 PMIC
- switch:
  - v00:RTL8367RB-VB-CG Switch chip ([datasheet](#))
    - gmac1/eth0 - only for lan-ports (wan-port directly connected to gmac0/eth1 via RTL8211 PHY)
  - 1.0: mt7531be chip ([datasheet](#))
    - vendor provides phy driver,dsa driver mainline but will need some changes
    - gmacs now swapped (gmac1 for wan,gmac0 with switch for lan)
- debug-uart is fixed to 1.5 mbaud,which is not supported by common usb2serial adapters (like my cp2102). More info [here](#)
  - working adapters: ch340g, ft232rl, cp2104
  - minicom -D /dev/ttyUSB1 -b 1500000
  - on v1.0 micro-usb can be used as debug-uart too
- ethernet/switch (rtl8367 phy+dsa driver,mt7531 only phy driver)/poweroff/reset/usb3/sata working in my repo, pcie (on v00 sometimes) working, leds (green + blue) working (green is ON-indicator)
- upper usb-Port (usbdrd3\_0: usb@fcc00000,bus 2-1) has phy configured in rk3568.dtsi (combphy0 does not exist on rk3566), lower port (usbdrd3\_1: usb@fd000000,bus 4-1) is configured in rk356x.dtsi (combphy1)
- combphy2 is used for sata2 (sata@fc800000)
- [GPIO](#)
- if emmc is bootable, it will be booted first, sdcard boot is only possible when pressing sw1 while poweron (till bl2 is shown)

## Software

my board had a broken bootchain on emmc which prevents bootup from sdcard. Board can be booted up when pressing switch labeled „MASKROOM“ while poweron. This shortcuts emmc and so skip this. Mostly emmc is not available from uboot, so i needed to boot linux kernel (which does emmc init again). There it was possible to erase beginning of emmc user-partition (mmcblk1).

```
dd if=/dev/zero of=/dev/mmcblk1 bs=1M count=10
```

erasing the first 2M was not enough (should delete the idbloader at block 64)...

## ATF

Currently only binaries, no source

<https://github.com/rockchip-linux/rkbin/tree/master/bin/rk35>

[https://github.com/JeffyCN/rockchip\\_mirrors/tree/rkbin/bin/rk35](https://github.com/JeffyCN/rockchip_mirrors/tree/rkbin/bin/rk35)

There is a merge-request for basic support (bl31 without scmi and no ddr init):

<https://review.trustedfirmware.org/c/TF-A/trusted-firmware-a/+/-/16952/5>

I have merged it to my repo here:

## Uboot

[https://github.com/rockchip-linux/u-boot/blob/next-dev/configs/rk3568\\_defconfig](https://github.com/rockchip-linux/u-boot/blob/next-dev/configs/rk3568_defconfig)

<https://forum.pine64.org/showthread.php?tid=14507>

My own work:

<https://github.com/frank-w/u-boot>



R2pro is supported only till 2022-04 as 2022-07 contains Patches that break atf inclusion

2023-04 got patches to support r2ro again: <https://github.com/frank-w/u-boot/tree/2023-04-bpi>

default boot way is via BPI-BOOT/extlinux/extlinux.conf

```
menu title Select the boot mode
#timeout 1/10s
TIMEOUT 50
DEFAULT linux

LABEL linux
#KERNEL bpi-r2pro.itb
linux Image_5.17.gz
fdt rk3568-bpi-r2-pro.dtb
initrd /rootfs.cpio.lz4
#APPEND root=/dev/mmcblk1p3 rootwait rw earlyprintk
append earlycon=uart8250,mmio32,0xfe660000 console=ttyS2,1500000n8

LABEL linux-5.18-hdmi
#KERNEL bpi-r2pro.itb
linux Image_5.18_hdmi.gz
fdt rk3568-bpi-r2-pro-hdmi.dtb
```

```
initrd /rootfs.cpio.lz4
#APPEND root=/dev/mmcblk1p3 rootwait rw earlyprintk
append earlycon=uart8250,mmio32,0xfe660000 console=tty1 fbcon=map:0
console=ttyS2,1500000n8
```

## barebox

alternative to uboot as bootloader, supports ethernet/tftp-boot (wan-port only due to missing switch driver)

[barebox](#)

## Images

Debian/Ubuntu (using kernel from my repo):

<https://forum.banana-pi.org/t/r2pro-debian-bullseye-ubuntu-22-04/13395>

Armbian:

Source/Patches: <https://github.com/150balbes/build/tree/armbian-tv/patch/kernel/archive/media-5.19>

Download: <https://users.armbian.com/balbes150/bpir2pro/>

## Image creation

Current way is spl-uboot in idblock.bin loading full uboot (fip,uboot.img) on separate partition (p1).

partition-layout from peter geis:

[https://gitlab.com/pgwipeout/quartz64\\_ci/-/blob/main/.gitlab-ci.yml#L103](https://gitlab.com/pgwipeout/quartz64_ci/-/blob/main/.gitlab-ci.yml#L103)

i use [version from manjaro](#) in my `build.sh`

This way works with downstream (2017.x) and upstream (2021.10+) uboot. [Barebox](#) does not need uboot partition, but for compatibility reasons partition should be there.

## Linux

<https://github.com/JeffyCN/mirrors/tree/kernel-5.10>

<https://gitlab.com/pgwipeout/linux-next/-/commits/quartz64-v5.16/>

precompiled kernel/uboot/bootheaders

[https://gitlab.com/pgwipeout/quartz64\\_ci/-/jobs/2305059735/artifacts/browse/artifacts/](https://gitlab.com/pgwipeout/quartz64_ci/-/jobs/2305059735/artifacts/browse/artifacts/)

Started my own work here: <https://github.com/frank-w/BPI-R2-4.14/tree/5.16-next2>

## Network

- wan-port directly connected
- lan-ports over switch
  - v00: 3 switch drivers available, selectable in dts (in next2 tree all drivers are builtin):
    1. vendor phy driver (drivers/net/phy/rtk, CONFIG\_RTL8367RB\_GSW)
    2. my reduced phy driver (drivers/net/phy/rtl8367s\_mdio.c, CONFIG\_NET\_REALTEK\_MDIO)
    3. dsa driver (drivers/net/dsa/realtek/, CONFIG\_NET\_DSA\_REALTEK)
  - v1.0:
    - phy driver working in 5.17
    - dsa driver detects switch/ports after disabling resets, but no traffic yet

Further trees (like 5.17-r2pro\*) will not contain the full phy driver, only my reduced version and dsa.

## display stuff

vop2 driver (needed for HDMI)

V5 seems to work good for 720p, 1080p and 4k

<https://github.com/frank-w/BPI-R2-4.14/commits/5.17-r2pro-hdmi>

Hdmi audio and gpu support

Have hdmi output, hdmi audio, gpu works with peters defconfig.

needs actual userspace (e.g. ubuntu 21.10) and ppa:

<https://launchpad.net/~kisak/+archive/ubuntu/kisak-mesa>

in wayland/weston (have installed gnome too)

```
apt install gnome weston gl2mark
```

weston-info shows resolution

## debugging

```
# mount -t debugfs none /sys/kernel/debug/  
# cat /sys/kernel/debug/gpio  
# cat /sys/kernel/debug/pinctrl  
# cat /sys/kernel/debug/regulator/regulator_summary
```

## other

[Rockchip DTS git](#)

Sound / [Alsa](#)

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