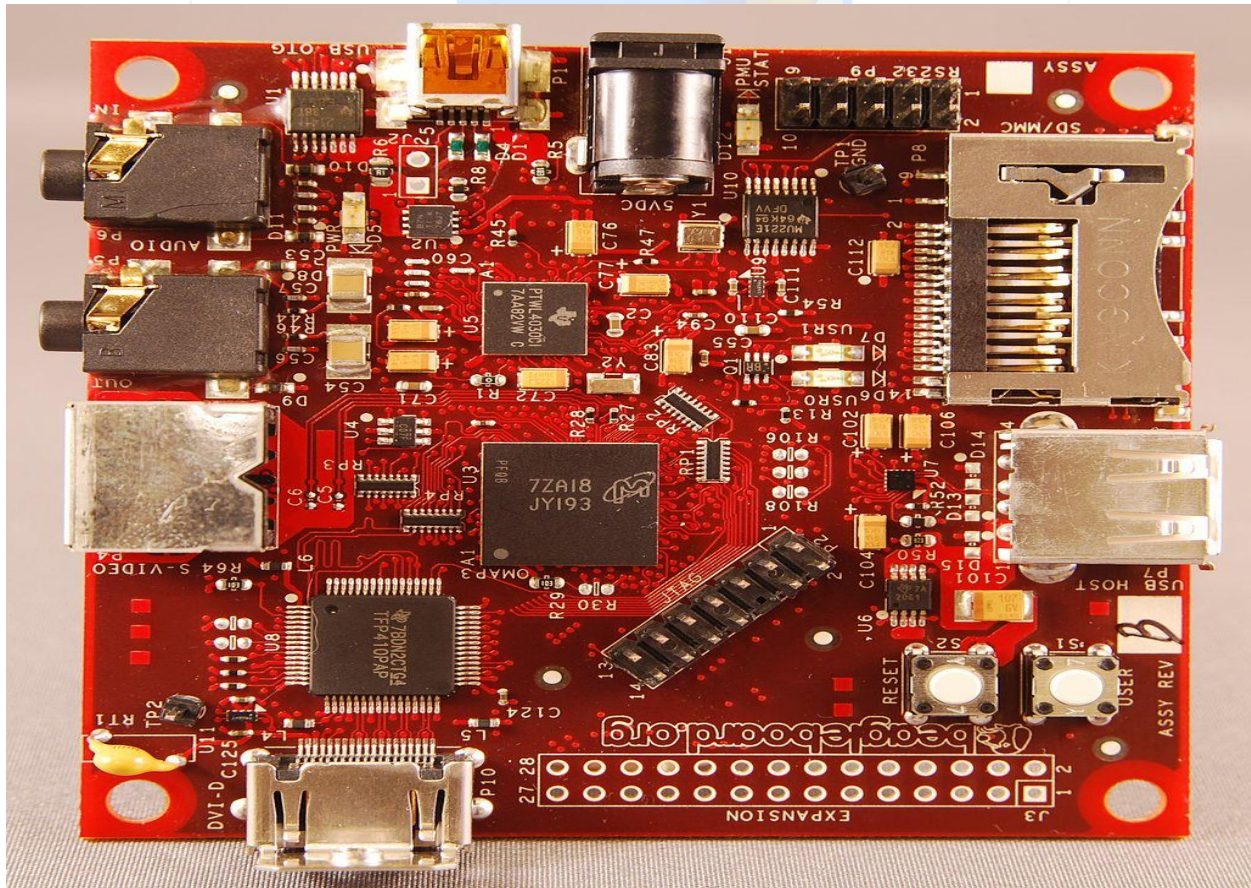


BEAGLE BONE

BeagleBoard: A Compact and Powerful Single-Board Computer.

BeagleBoard is an open-source, low-power single-board computer (SBC) developed by Texas Instruments in collaboration with Digi-Key and Newark element14. It was designed to demonstrate the capabilities of TI's OMAP3530 system-on-a-chip (SoC) and to support open-source software development. The BeagleBoard is widely used in education, embedded systems, robotics, and IoT applications.



Key Features of BeagleBoard

1. **Processor:** ARM Cortex-A8 (600 MHz - 1 GHz)
2. **Memory:** 128 MB - 512 MB RAM
3. **Storage:** Supports SD/MMC cards; some models include onboard NAND flash
4. **Connectivity:** USB On-The-Go, RS-232 serial, JTAG debugging
5. **Ports:**
 - **Video:** HDMI, DVI-D, S-Video
 - **Audio:** 3.5mm stereo jacks
 - **USB:** USB OTG and USB host ports
6. **Power Consumption:** Low power (~2W)
7. **Size & Weight:** ~7.62 cm x 7.62 cm, ~37g

Laptop-like performance

TI OMAP3530

- 600 MHz superscaler ARM® Cortex™-A8
- More than 1200 Dhrystone MIPS
- Up to 10 Million polygons per sec graphics
- HD video capable C64x+™ DSP core

Memory

- 128MB LPDDR RAM
- 256MB NAND flash

3"



Flexible expansion

- I²C, I²S, SPI, MMC/SD
- DVI-D
- JTAG
- S-Video
- SD/MMC+
- Stereo Out
- Stereo In
- USB 2.0 HS OTG
- Alternate Power
- RS-232 Serial

Development & Use Cases

- **Operating System Support:** BeagleBoard supports multiple OS options, including:
 - **Linux distributions:** Ubuntu, Debian, Fedora, Angstrom, Arch Linux
 - **Other OS:** FreeBSD, OpenBSD, Android, Windows CE, RISC OS, QNX

- **Programming & Development:**

- Used for embedded programming, IoT, robotics, and AI applications.
- Supports Python, C/C++, Java, and other languages.

- **Educational Purpose:**

- Commonly used in colleges and universities for teaching open-source hardware and software development.

BeagleBoard Variants

Several variants of the BeagleBoard have been introduced over time with improved specifications:

1. BeagleBoard-xM (2010)

- Upgraded CPU (1 GHz) and RAM (512 MB)
- Onboard Ethernet and 4 USB ports
- Lacks NAND flash, requiring boot from an SD card

2. BeagleBone (2011)

- A smaller, cost-effective version
- 720 MHz ARM Cortex-A8, 256 MB RAM
- Includes 2 expansion connectors for additional hardware ("Capes")

3. BeagleBone Black (2013)

- Improved version of BeagleBone
- 1 GHz processor, 512 MB RAM
- 4 GB onboard eMMC flash storage
- Includes HDMI support

4. BeagleBoard-X15 (2015)

- Dual-core ARM Cortex-A15 processor (1.5 GHz)
- 2 GB RAM, USB 3.0, HDMI, Gigabit Ethernet
- Designed for high-performance applications

5. PocketBeagle (2017)

- Ultra-compact version (~50% smaller than BeagleBone Black)
- Reduced cost and weight

- Designed for embedded systems and robotics

Comparison with Raspberry Pi

Feature	BeagleBoard / BeagleBone Black	Raspberry Pi 4
Processor	ARM Cortex-A8 (1 GHz)	ARM Cortex-A72 (1.5 GHz)
RAM	512 MB DDR3	2-8 GB LPDDR4
Storage	4 GB eMMC + microSD	microSD only
OS Support	Linux, Windows CE, FreeBSD, Android	Linux, Raspberry Pi OS
Ports	HDMI, USB, Ethernet	HDMI, USB, Ethernet
Target Use	Embedded systems, industrial applications	General computing, education

Conclusion

BeagleBoard and its variants are powerful, low-cost single-board computers that offer great flexibility for embedded development, robotics, and education. While Raspberry Pi is more popular for

general computing and beginner projects, BeagleBoard provides better expandability, industrial-grade support, and open-source hardware advantages.

