BeagleBone Black (BB-Black) – 4GB eMMC Flash Linux Development Board

The **BeagleBone Black (BB-Black)** is a powerful, open-source Linux development board designed to provide engineers, hobbyists, and educators with an affordable yet high-performance platform for embedded computing and IoT development. Built around the **Texas Instruments Sitara AM3358 ARM Cortex-A8 processor**, the BeagleBone Black delivers an excellent balance of processing power, connectivity, and expandability in a compact 86mm × 53mm form factor.

Whether you are developing industrial automation systems, robotics projects, or edge computing devices, the BeagleBone Black offers everything needed to bring innovative ideas to life.

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Beaglebone Black BB-Black with 4G flash[/caption]

⚙ High-Performance Hardware

At its core, the BeagleBone Black features a **1GHz ARM Cortex-A8 CPU**, capable of handling complex real-time operations, multitasking, and data processing. The processor includes a **3D graphics accelerator** for rendering visual data and graphics-based applications, a **NEON floating-point accelerator** for mathematical computations, and **two 32-bit Programmable Real-time Units (PRUs)** for precise timing control and hardware interfacing.

The board is equipped with **512MB of DDR3 RAM**, providing fast memory access for multitasking and high-speed data handling. In addition, it includes **4GB of onboard eMMC flash**

storage, pre-flashed with the Debian operating system, allowing you to power up and start developing right out of the box. You can also expand your storage using a **microSD card slot**, perfect for installing custom OS images or adding extra file storage.

🔌 Comprehensive Connectivity Options

Connectivity is one of the BeagleBone Black's strongest advantages. The board provides a wide range of I/O interfaces and ports to connect to peripherals, sensors, and networks with ease:

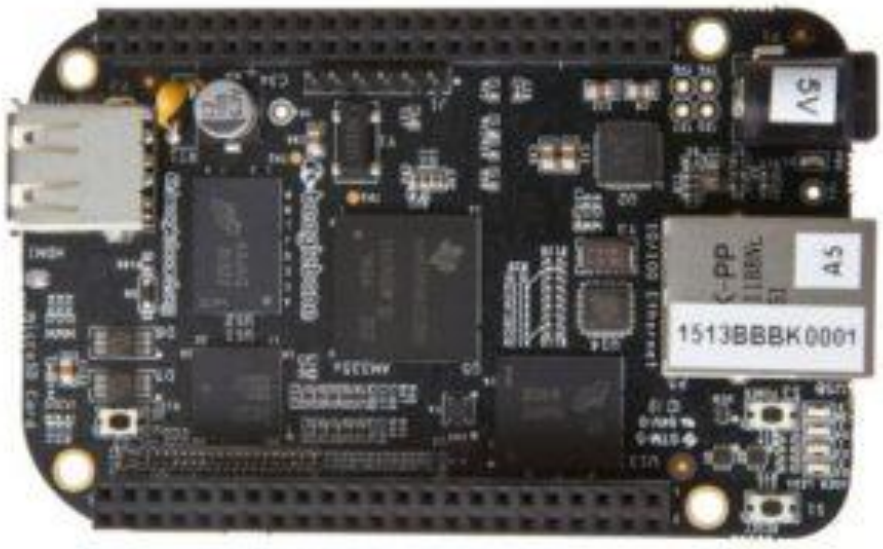
- **USB Device Port:** Enables both power supply and data transfer from a PC.
- **USB Host Port:** Connect peripherals such as Wi-Fi dongles, keyboards, or external drives.
- **Ethernet Port:** Delivers high-speed wired network access, ideal for IoT gateways or networked automation.
- **HDMI Output:** Allows you to connect a monitor directly, providing a full graphical user interface experience.
- **2× 46-Pin Expansion Headers:** Offer access to over **65 GPIO pins**, supporting **UART, SPI, I²C, PWM, ADC**, and more. These headers make it easy to connect expansion capes, custom circuits, and external modules.

- **Power Input Options:** Can be powered via **USB cable** or **5V DC barrel jack**, offering flexibility for both portable and stationary applications.

This combination of features makes the BeagleBone Black perfect for integration into robotics systems, machine control, and IoT environments.

💻 Software Compatibility and Development Environment

The BeagleBone Black is designed for **open-source development** and supports a wide variety of operating systems and programming environments. It comes with **Debian Linux pre-installed** on its eMMC, offering a stable, well-supported platform for development. You can also install other OS distributions like **Ubuntu**, **Android**, or **Ångström Linux**, depending on your project's needs.



For developers, BeagleBone Black provides a seamless workflow:

- The board includes **Cloud9 IDE on Node.js**, a browser-based development environment that allows coding directly from your web browser.

- The **BoneScript JavaScript library** provides easy access to GPIO pins and peripherals, simplifying hardware control and automation.
- Developers can also use **Python**, **C/C++**, or **Bash scripting** for advanced or performance-critical applications.

With full support for **Git**, **SSH**, and **remote debugging**, BeagleBone Black delivers a professional-grade embedded Linux experience.

 Applications and Use Cases

The versatility of the BeagleBone Black makes it suitable for a broad range of applications across education, industry, and research. Some popular use cases include:

- **IoT Gateways & Edge Computing** – Reliable for real-time data collection, analysis, and control.
- **Robotics & Automation** – Perfect for motor control, sensor fusion, and navigation.
- **Industrial Systems** – Used in programmable controllers, monitoring devices, and machine interfaces.
- **Embedded Linux Learning** – A hands-on tool for students and educators in computer engineering and mechatronics.
- **Multimedia Systems** – Supports HDMI display output and graphical interfaces for kiosks and digital signage.

With its dual PRU cores, the BeagleBone Black can execute deterministic tasks in parallel with Linux operations, making it ideal for timing-sensitive industrial and robotic systems.

 What's Included

- 1× BeagleBone Black Development Board (4GB eMMC Flash)
- Pre-loaded Debian Linux operating system
- User documentation and online resources
- Open-source hardware and software community support

 Why Choose BeagleBone Black?

Developed by **BeagleBoard.org**, a globally trusted open-source hardware community, the BeagleBone Black provides unmatched transparency and flexibility. Its extensive documentation, active developer community, and long-term support make it a dependable platform for prototyping and production environments alike.

Whether you're a **student learning embedded Linux**, a **researcher developing smart automation systems**, or a **professional engineer building an industrial solution**, the BeagleBone Black delivers reliable performance, open hardware design, and professional-grade capabilities—all at an affordable price.

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