

is powered by ARM® big.LITTLE™ technology, comes with a **Heterogeneous Multi-Processing (HMP)** solution.

ODROID-XU3 is a new generation of computing device with more powerful, more energy-efficient hardware and smaller form factor. Offering open source support, the board can run various flavours of Linux, including the latest Ubuntu 14.04 and the Android 4.4. By adopting e-MMC 5.0 and USB 3.0 interface, the ODROID-XU3 boasts fast data transfer speed, a feature that is increasingly required to support advanced processing power on ARM devices that allows users can fully experience an upgrade in computing such as faster booting, web browsing and 3D game experience.

- Samsung Exynos5422 Cortex™-A15 2.0Ghz quad core and Cortex™-A7 quad core CPUs
- Mali-T628 MP6(OpenGL ES 3.0/2.0/1.1 and OpenCL 1.1 Full profile)
- 2Gbyte LPDDR3 RAM at 933MHz (14.9GB/s memory bandwidth) PoP stacked
- eMMC5.0 HS400 Flash Storage
- USB 3.0 Host x 1, USB 3.0 OTG x 1, USB 2.0 Host x 4
- HDMI 1.4a and DisplayPort1.1 for display
- Integrated power consumption monitoring tool

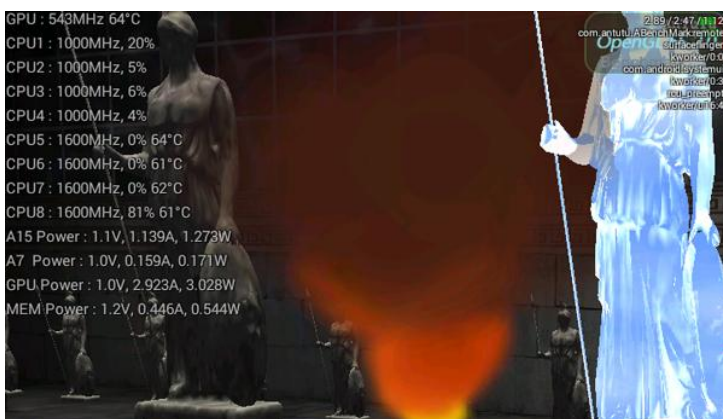


Note!! The package includes a XU3 board, a plastic case, an active cooler and 5V/4A PSU. You need additional MicroSD card or an eMMC module to install the OS. We strongly recommend eMMC module for much higher performance boosting.

SPECIFICATIONS

Processor	Samsung Exynos5422 ARM® Cortex™-A15 Quad 2.0GHz/Cortex™-A7 Quad 1.4GHz
Memory	2Gbyte LPDDR3 RAM PoP (933Mhz, 14.9GB/s memory bandwidth, 2x32bit bus)
3D Accelerator	Mali™-T628 MP6 OpenGL ES 3.0 / 2.0 / 1.1 and OpenCL 1.1 Full profile
Energy Monitor	Measure the power consumption of Big cores, Little cores, GPU and DRAM individually. Accurate current sensors and voltage sensors are implemented on PCB for energy measurement.
Audio	On-board Audio codec / Standard 3.5mm headphone jack. HDMI Digital audio output. Optional SPDIF optical output (USB module)
USB3.0 Host	SuperSpeed USB standard A type connector x 1 port
USB3.0 OTG	SuperSpeed USB Micro A-B type connector x 1 port
USB2.0 Host	High Speed standard A type connector x 4 ports
Display	HDMI, DisplayPort
Storage (Option)	eMMC module socket : eMMC 5.0 Flash Storage (up to 64GByte) MicroSD Card Slot (up to 64GByte)
Fast Ethernet LAN	10/100Mbps Ethernet with RJ-45 Jack (Auto-MDIX support)
Gigabit Ethernet LAN (Option)	USB3.0 to Gigabit Ethernet adapter (USB module)

WiFi (Option)	USB IEEE 802.11b/g/n 1T1R WLAN with Antenna (USB module)
HDD/SSD SATA interface (Optional)	SuperSpeed USB (USB 3.0) to Serial ATA3 adapter for 2.5"/3.5" HDD and SSD storage
Power (included)	5V 4A Power
System Software	Ubuntu 14.04 + OpenGL ES + OpenCL on Kernel LTS 3.10 Android 4.4.2 on Kernel LTS 3.10 Full source code is accessible via our Github.
Case (included)	Mechanical case & cooler (98 x 74 x 29 mm approx.)
PCB Size	94x70x18 mm approx.



Integrated power consumption monitoring tool

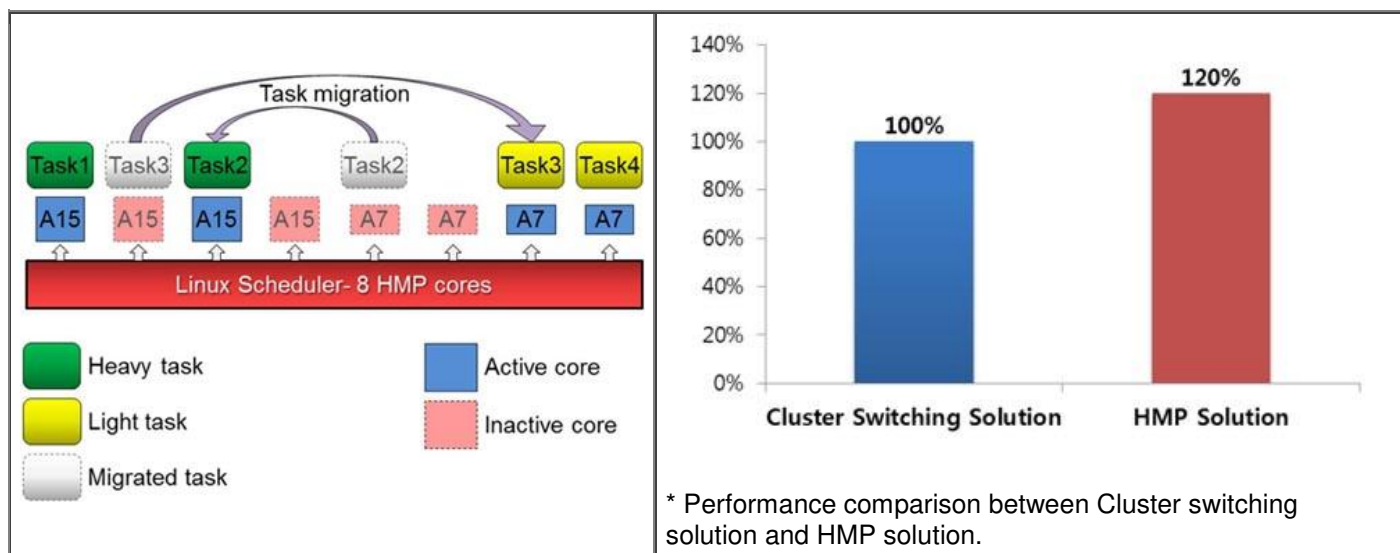
ODROID-XU3 has the integrated power analysis tool. 4 current/voltage sensors measure the power consumption of the Big A15 cores, Little A7 cores, GPUs and DRAMs individually.

The professional developers can monitor CPU, GPU and DRAM power consumption via included on-board power measurement circuit. By using the integrated power analysis tool, developers will reduce the need for repeated trials when debugging for power consumption and get the opportunity to enhance and optimize the performance of their CPU/GPU compute applications, and therefore keeping power consumption as low as possible.

Frequency, Voltage, Ampere and Power information shows as an on-screen-overlay in Android platform. You can monitor 4 big cores and GPU temperature too.

Heterogeneous Multi-Processing (HMP) solution

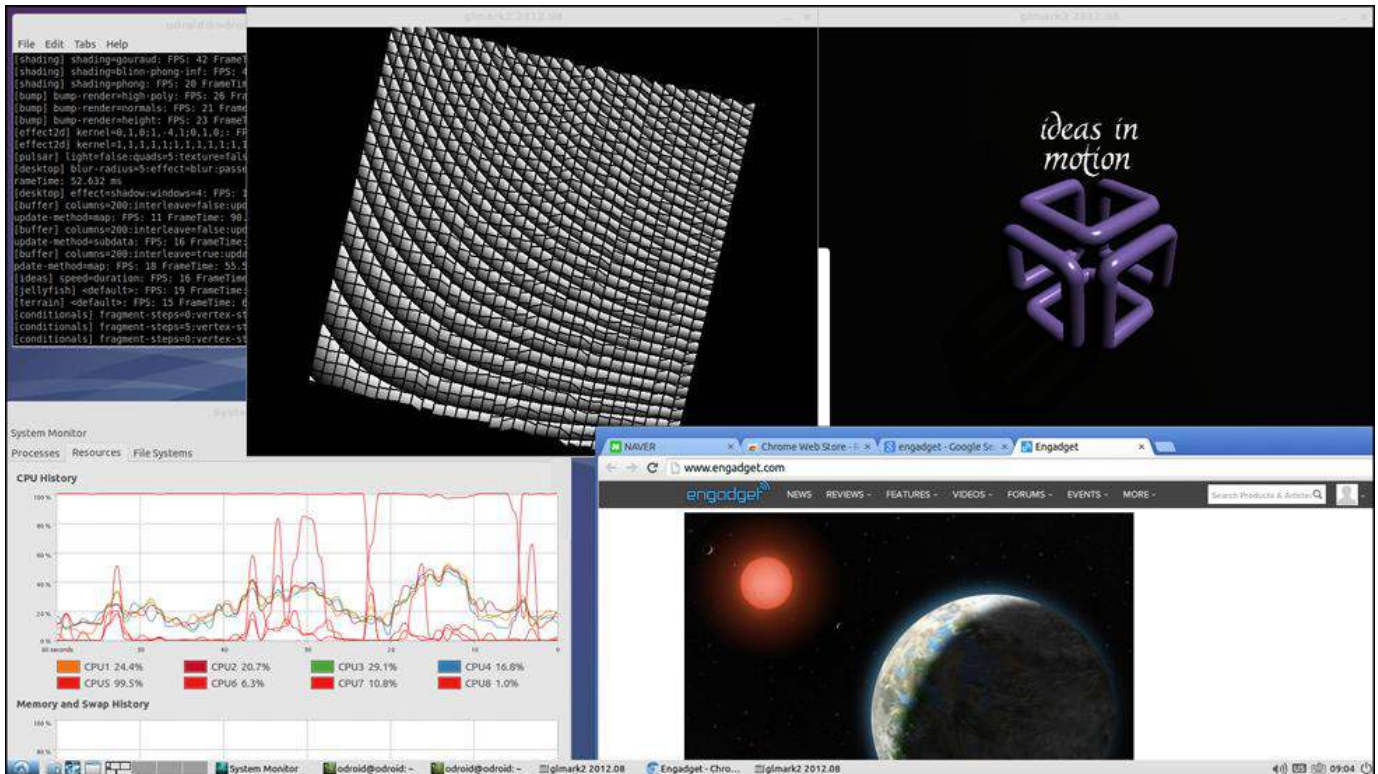
ODROID-XU3, equipped with four big cores (ARM® Cortex® -A15™ up to 2.0GHz) and four small cores (ARM® Cortex® -A7™ up to 1.4 GHz), provides improved processing capabilities while maintaining the most efficient power consumption imaginable. With the big.LITTLE™ HMP solution, Exynos-5422 can utilize a maximum of all eight cores to manage computationally intensive tasks.



OpenGL ES 3.0 and OpenCL 1.1 for Linux and Android platforms

The ARM® Mali™-T628 MP6 GPU offers key API support OpenGL ES 1.1, OpenGL ES 2.0 and OpenGL ES 3.0, OpenCL 1.1 Full Profile and Google RenderScript. Mali-T628 is the GPU of choice for use in the next generation of market-leading devices, optimized to bring breathtaking graphical displays to consumer applications such as 3D graphics, visual computing, augmented reality, procedural texture generation and voice recognition. You can download the full featured OpenGL ES and OpenCL SDK from ARM Mali Developer website. It is even free!

Below screen-shot shows the OpenGL-ES + OpenCL + Chromium browser with Ubuntu 14.04 on the HMP enabled Kernel 3.10 LTS.



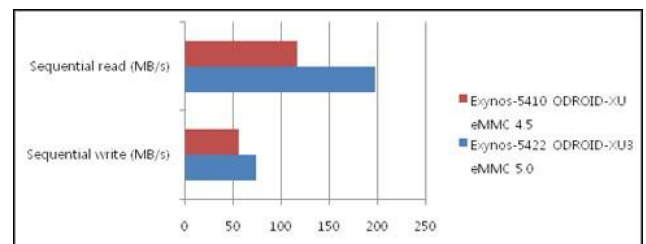
eMMC 5.0

eMMC uses intelligent flash memory technology that not only offers the capacity to store digital content, but also meets even stricter high sequential and random performance requirements to ensure a strong user experience. This enables fast OS booting, quick application launching, seamless multi-tasking, and quick access to the cloud.

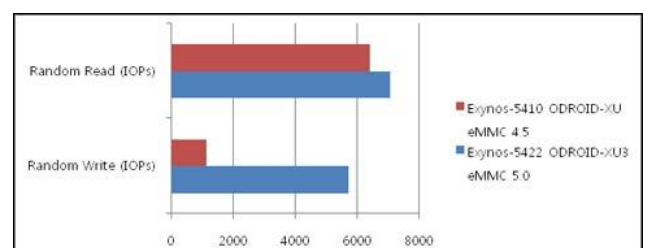
In October 2013 JEDEC published the latest version of its popular eMMC standard: JESD84-B50: Embedded MultiMediaCard, Electrical Standard (5.0). eMMC v5.0 defines several new functionalities and enhancements for embedded mass-storage flash memory widely used in smartphones and other mobile devices; and matches the challenging performance targets required by the next generation of mobile systems by introducing an HS400 mode that offers additional improvement in terms of interface speed (up to 400 MB/s vs 200 MB/s in the prior version). JESD84-B50 is available for free download from the JEDEC website. <http://www.jedec.org/standards-documents/results/jesd84-b50>

We've compared the performance of eMMC 4.5 with eMMC 5.0 on the ODROID boards.

read/write

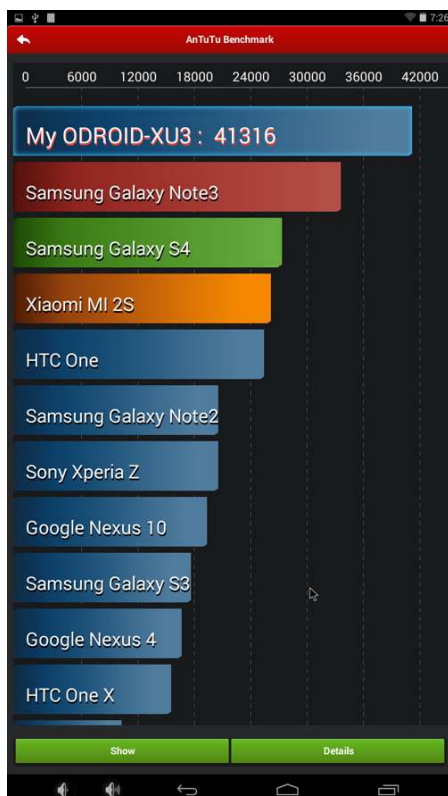


- Random read/write

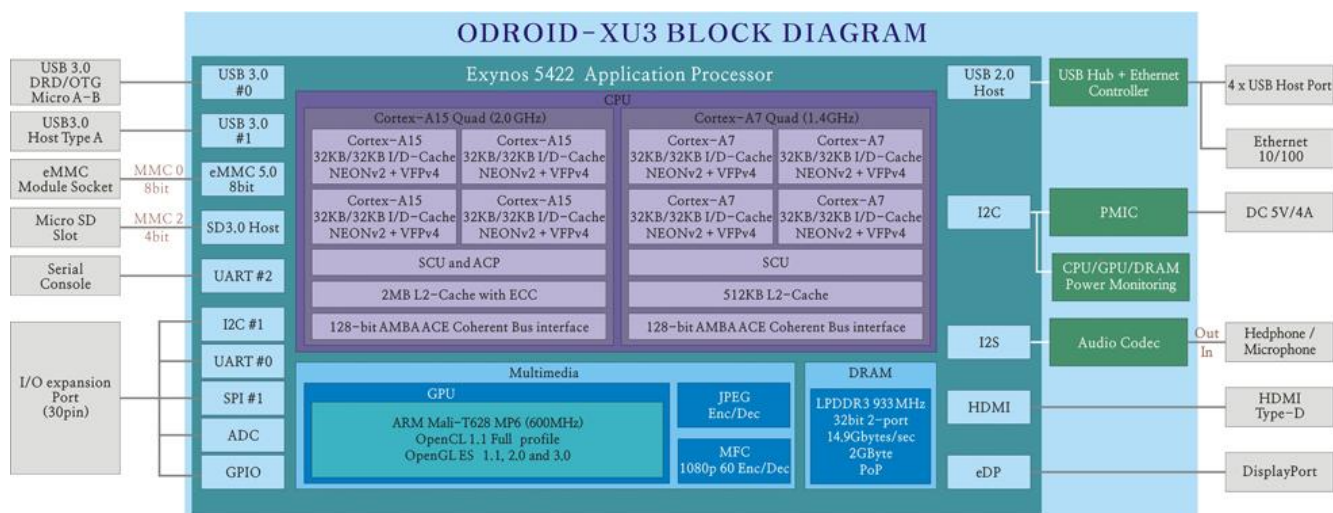


	Exynos-5422 OROID-XU3 eMMC 5.0	Exynos-5410 OROID-XU eMMC 4.5
Sequential write (MB/s)	74	56
Sequential read (MB/s)	198	117
Random write (IOPs)	5749	1144
Random read (IOPs)	7076	6419

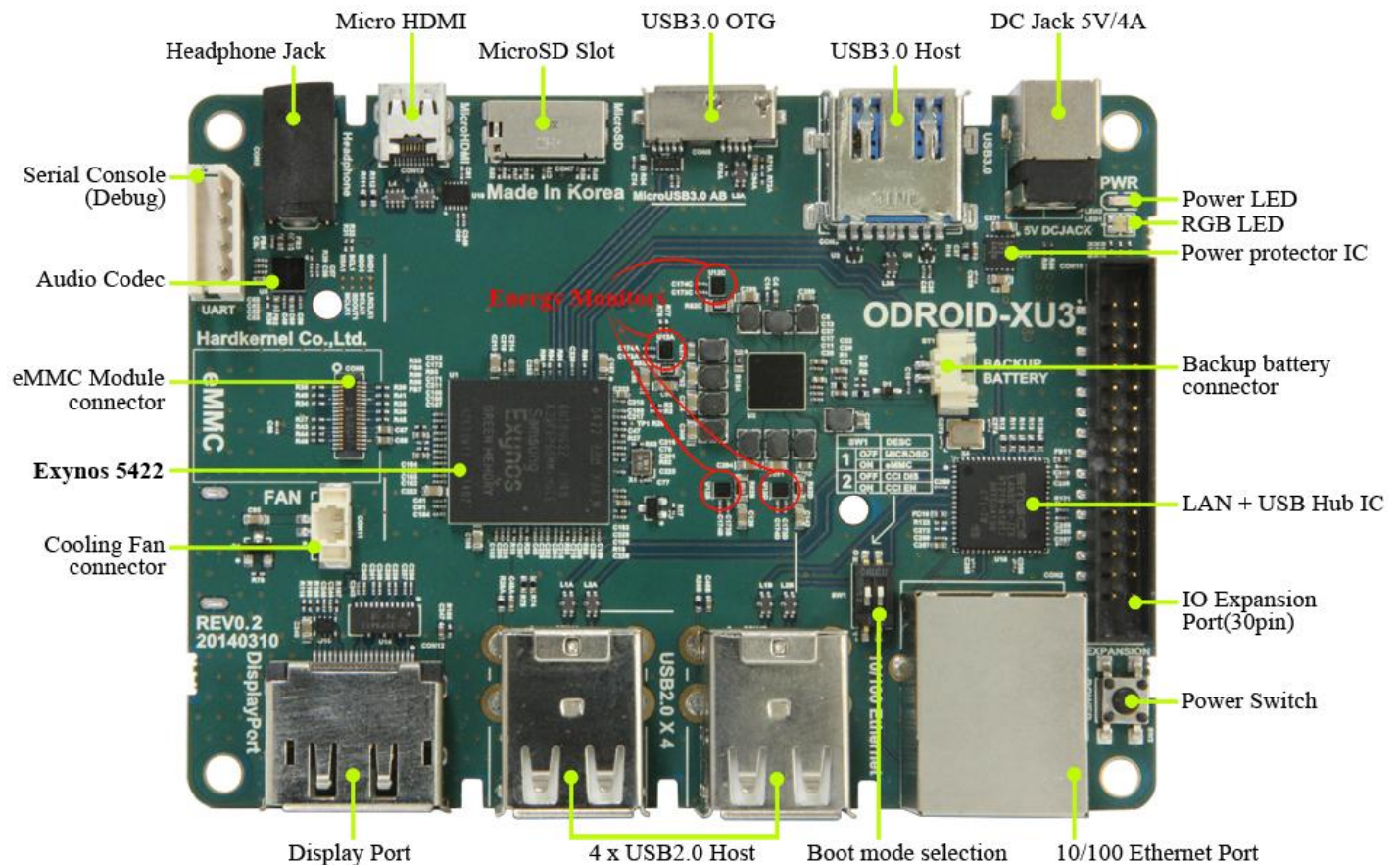
ODROID-XU3 shows Leading Edge Performance!



BLOCK DIAGRAM



BOARD DETAIL



CPU	Samsung Exynos-5422 : Cortex™-A15 and Cortex™-A7 big.LITTLE processor with 2GByte LPDDR3 RAM
eMMC 5.0 module (Option)	16GB/32GB : Sandisk iNAND Extreme 64GB : Toshiba eMMC
PMIC	Samsung S2MPS11 9 high-efficiency Buck, 1 Buck-Boost regulators, RTC and 38 LDOs. Contact Samsung for more information
LAN/USB Hub	LAN9514 4-port Hi-Speed USB 2.0 hub and 10/100 Ethernet controllers from SMSC/Microchip
USB Load Switch	NCP380 Protection IC for USB power supply from OnSemi.
Audio Codec	MAX98090 is a full-featured and high performance audio CODEC from Maxim
Power protector	NCP372 Over-voltage, Over-current, Reverse-voltage protection IC from OnSemi.
LED indicator	Tri-color RGB LED to display the status of operating system
HDMI connector	Standard Micro-HDMI, supports up to 1920 x 1080 resolution
DisplayPort connector	Standard DisplayPort, supports up to 3840 x 2160 resolution
IO Ports	USB 3.0 Host x 1, USB 2.0 Host x 4, USB 3.0 OTG x 1, PWM for Cooler Ethernet RJ-45, Headphone Jack, 30Pin : GPIO/IRQ/SPI/ADC
Storage slot	Micro-SD slot, eMMC 5.0 module connector
DC Input	5V / 4A input, Plug specification is inner diameter 2.1mm and outer diameter 5.5mm
Energy Monitor	4 separated current sensors to measure the power consumption of Big CPU, Little CPU, GPU and DRAM in real time