

Introduction

BeaglePlay is an open-source single board computer designed to simplify the process of adding sensors, actuators, indicators, human interfaces, and connectivity to a reliable embedded system. It features a powerful 64-bit, quad-core processor and innovative connectivity options, including WiFi, Gigabit Ethernet, sub-GHz wireless, and single-pair Ethernet with power-over-data-line. With compatibility with 1,000s of off-the-shelf add-ons and a customized Debian Linux image, BeaglePlay makes expansion and customization easy. It also includes ribbon-cable connections for cameras and touch-screen displays, and a socket for a battery-backed real-time-clock, making it ideal for human-machine interface designs. With its competitive price and user-friendly design, we expect BeaglePlay to provide you with a positive development experience. Some of the real world applications for BeaglePlay include:

- Building/industrial automation gateways
- Digital signage
- Human Machine Interface (HMI)
- BeagleConnect sensor gateways

Contributors

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Note

Make sure to read and accept all the terms & condition provided in the [Terms & Conditions](#) page.

Use of either the boards or the design materials constitutes agreement to the T&C including any modifications done to the hardware or software solutions provided by beagleboard.org foundation.

Detailed overview

BeaglePlay is built around Texas Instruments AM62x Sitara™ Processors which is a Quad-Core Arm® Cortex®-A53 Human-machine-interaction SoC. It comes with 2GB DDR4 RAM, 16GB

eMMC storage, Full size HDMI, USB-A host port, USB-C power & connectivity port, serial debug interface, and much more.

Table 1 BeaglePlay features

Feature	Description
Processor	TI AM6254 (multicore A53s with R5, M4s and PRUs)
PMIC	TPS6521901
Memory	2GB DDR4
Storage	16GB eMMC
WiFi	<ul style="list-style-type: none"> PHY: WL1807MOD (roadmap to next-gen TI CC33XX WiFi 6 & BLE) Antennas: 2.4GHz & 5GHz
BLE/SubG	<ul style="list-style-type: none"> CC1352P7 M4+M0 with BeagleConnect firmware BeagleConnect Wireless enabled Antennas: 2.4GHz & SubG IEEE802.15.4 software defined radio (SDR)
Ethernet	<ul style="list-style-type: none"> PHY: Realtek RTL8211F-VD-CG Gigabit Ethernet phy Connector: integrated magnetics RJ-45
Single-pair Ethernet	<ul style="list-style-type: none"> BeagleConnect Wired enabled PHY: DP83TD510E 10Mbit 10BASE-T1L single-pair Ethernet phy Connector: RJ-11 jack Power (PoDL): Input: N/A (protection to 12V), Output: 5V @ 250mA
USB type-C	<ul style="list-style-type: none"> PD/CC: None, HS shorted to both sides Power: Input: 5V @ 3A, Output: N/A (USB-C DRP Not supported)
HDMI	<ul style="list-style-type: none"> Transmitter: IT66121 Connector: full-size
Other connectors	<ul style="list-style-type: none"> microSD USB 2.0 type-A (480Mbit) mikroBUS connector (I2C/UART/SPI/MCAN/MCASP/PWM/GPIO) Grove connector (I2C/UART/ADC/PWM/GPIO)

Table 1 BeaglePlay features

Feature	Description
	<ul style="list-style-type: none">• QWIIC connector (I2C)• CSI connector compatible with BeagleBone AI-64, Raspberry Pi Zero / CM4 (22-pin)• OLDI connector (40-pin)

AM6254 SoC

The low-cost Texas Instruments AM625 family of application processors are built for Linux® application development. With scalable Arm® Cortex®-A53 performance and embedded features, such as: dual-display support and 3D graphics acceleration, along with an extensive set of peripherals that make the AM62x device well-suited for a broad range of industrial and automotive applications while offering intelligent features and optimized power architecture as well.

Some of these applications include:

- Industrial HMI
- EV charging stations
- Touchless building access
- Driver monitoring systems

AM625 processors are industrial-grade in the 13 x 13 mm package (ALW) and can meet the AEC-Q100 automotive standard in the 17.2 x 17.2 mm package (AMC). Industrial and Automotive functional safety requirements can be addressed using the integrated Cortex-M4F core and dedicated peripherals, which can all be isolated from the rest of the AM62x processor.

Tip

For more details checkout <https://www.ti.com/product/AM625>

The 3-port Gigabit Ethernet switch has one internal port and two external ports with Time-Sensitive Networking (TSN) support. An additional PRU module on the device enables real-time I/O capability for customer's own use cases. In addition, the extensive set of peripherals included in AM62x enables system-level connectivity, such as: USB, MMC/SD, CSI Camera interface, OSPI, CAN-FD and GPMC for parallel host interface to an external ASIC/FPGA. The AM62x

device also employs advanced power management support for portable and power-sensitive applications.

Board components location

This section describes the key components on the board, their location and function.

Front components location

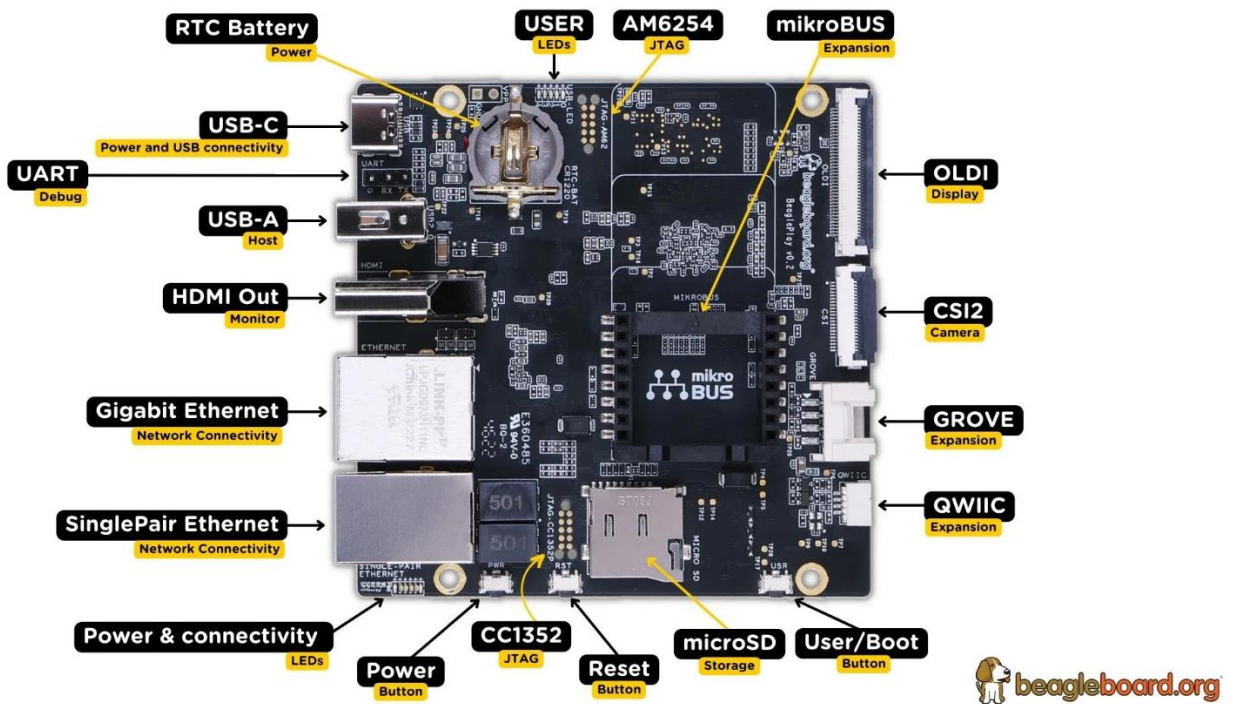


Fig. 1 BeaglePlay board front components location

Table 2 BeaglePlay board front components location

Feature	Description
RTC Battery	BQ32002 Real Time Clock (RTC) Battery holder takes CR1220 3V battery
User LEDs	Five user LEDs, Power and boot section provides more details. These LEDs are connect to the AM6254 SoC
JTAG (AM62)	AM6254 SoC JTAG debug port

Table 2 BeaglePlay board front components location

Feature	Description
mikroBUS	mikroBUS for MikroE Click boards or any compliant add-on
OLDI	AM6254 OpenLDI(OLDI) display port
CSI	AM6254 Camera Serial Interface (MIPI CSI-2)
Grove	SeeedStudio Grove modules connection port
QWIIC	SparkFun QWIIC / Adafruit STEMMA-QT port for I2C modules connectivity
User Button	Programmable user button, also servers as boot mode select button (SD Card/eMMC). Press down to select SD Card as boot medium
SD Card	Use to expand storage, boot linux image or flash latest image on eMMC
Reset button	Press to reset BeaglePlay board (AM6254 SoC)
JTAG (CC1352)	JTAG debug port for CC1352P7
Power button	Press to shut-down (OFF), hold down to boot (ON)
Power & Connectivity LEDs	Indicator LEDs for Power ON, CC1352 RF, and Single-pair connectivity
Single-pair Ethernet	Single-pair Ethernet connectivity port with power over data line
GigaBit Ethernet	1Gb/s Wired internet connectivity
HDMI Output	Full size HDMI port for connecting to external display monitors
USB-A host port	Port to connect USB devices like cameras, keyboard & mouse combos, etc
USB-C port	Power and Device data role port

Back components location

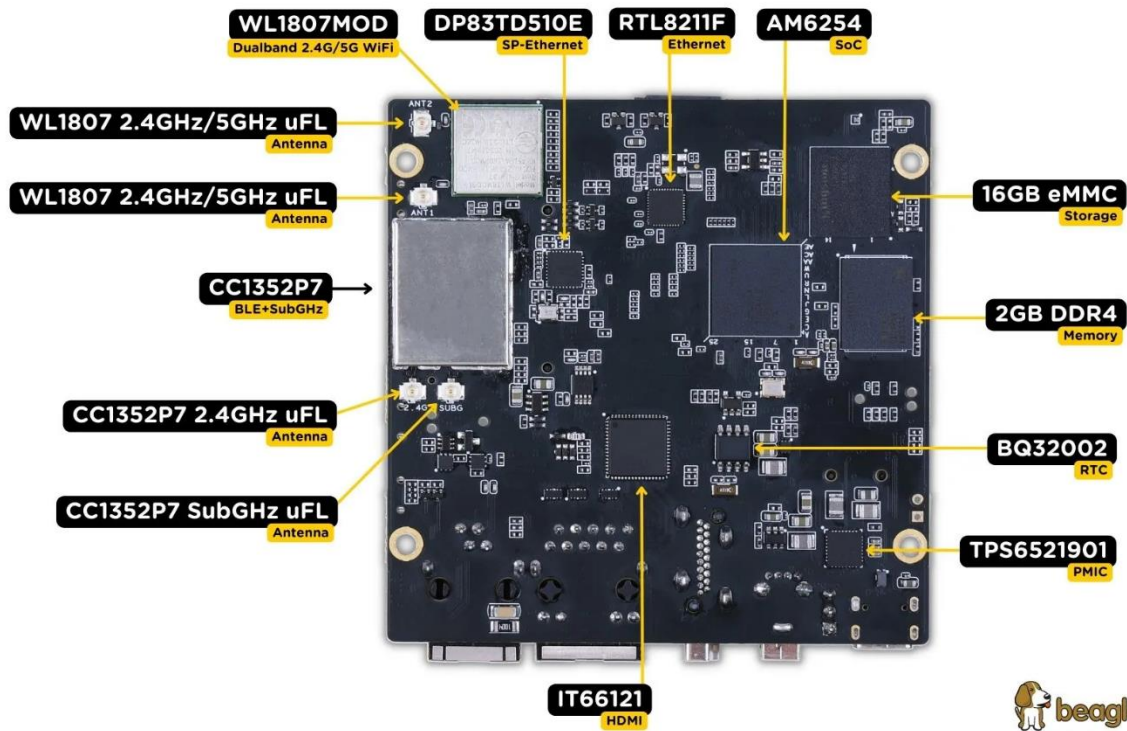


Fig. 2 BeaglePlay board back components location

Table 3 BeaglePlay board back components location

Feature	Description
CC1352P7	2.4GHz BLE + SubG IEEE 802.15.4 with 1 x 2.4GHz + 1 x SubG uFL antenna
WL1807MOD	Dual band (2.4GHz & 5GHz) WiFi module with 2 x uFL antennas
DP83TD510E	Single-pair IEEE 802.3cg 10BASE-T1L Ethernet PHY
RTL8211F	Gigabit IEEE 802.11 Ethernet PHY
AM6254	Main SoC
16GB eMMC	Flash storage
2GB DDR4	RAM / Memory
BQ32002	Real Time Clock (RTC)
TPS6521901	Power Management IC

Table 3 BeaglePlay board back components location

Feature	Description
IT66121	HDMI Transmitter

What's included in the box?

When you purchase a brand new BeaglePlay, In the box you'll get:

1. BeaglePlay board
2. One (1) sub-GHz antenna
3. Three (3) 2.4GHz/5GHz antennas
4. Plastic standoff hardware
5. Quick-start card



Attaching antennas¹

Note

Attaching the antennas can be complicated. This is not the expected BeaglePlay experience and we hope to fix it in the future. This is necessary if you plan to use any of the wireless connectivity features.

Important

Add documentation on attaching antennas here.

You can watch this video to see how to attach the antennas.

<https://youtu.be/8zeIVd-JRc0>

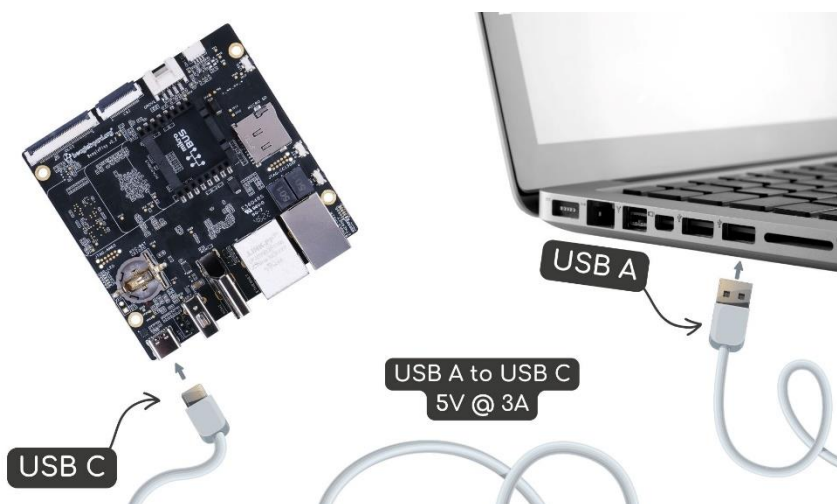
Tethering to PC¹

Tip

Checkout [Getting Started Guide](#) for,

1. Updating to latest software.
2. Power and Boot.
3. Network connection.
4. Browsing to your Beagle.
5. Troubleshooting.

For tethering to your PC you'll need a USB-C data cable.



Design and specifications

If you want to know how the BeaglePlay hardware is designed and what are its high-level specifications then this chapter is for you. We are going to discuss each hardware design element in detail and provide high-level device specifications in a short and crisp form as well.

Tip

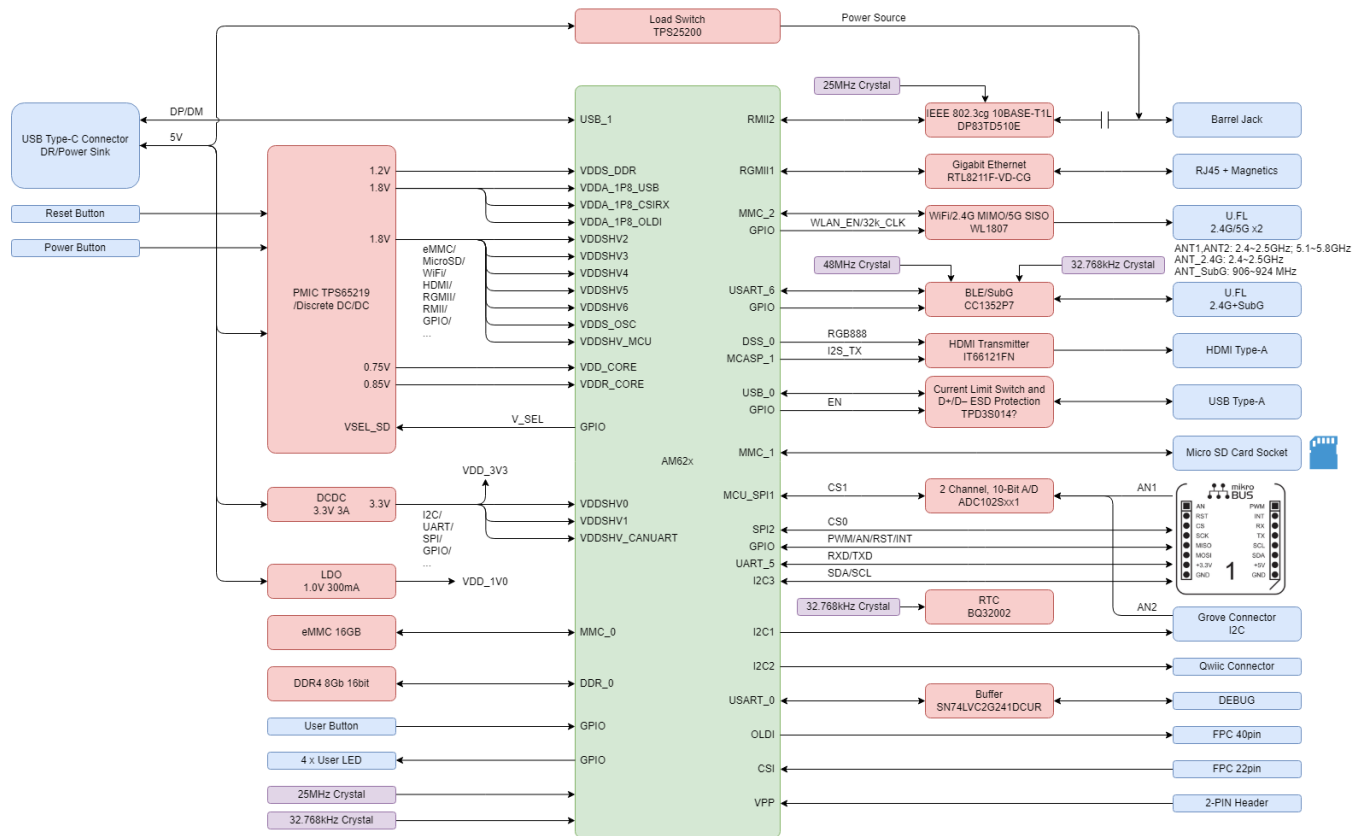
You can download BeaglePlay schematic to have clear view of all the elements that makes up the BeaglePlay hardware.

[BeaglePlay design repository](#)

Block diagram

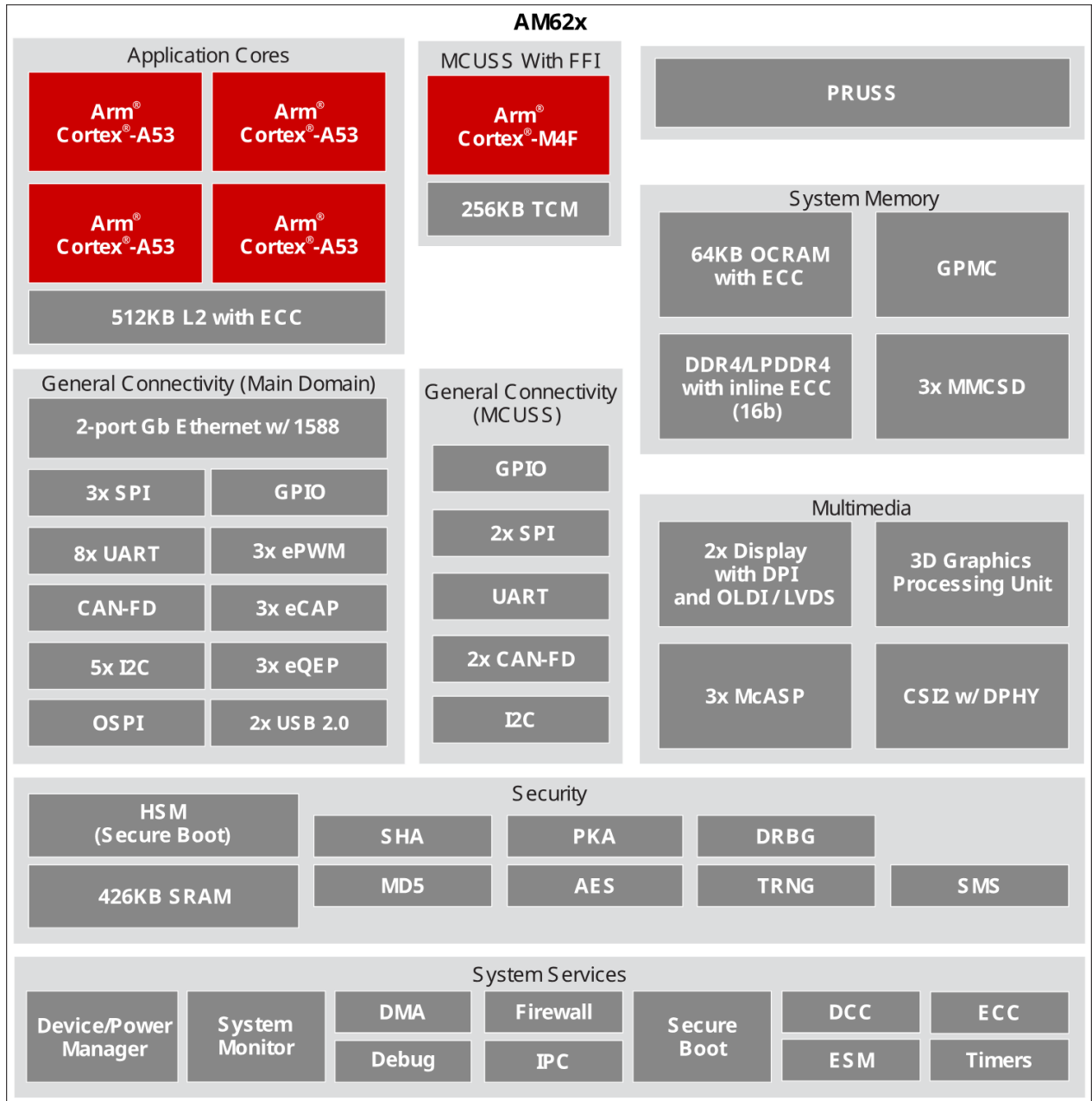
The block diagram below shows all the parts that makes up your BeaglePlay board. BeaglePlay as mentioned in previous chapters is based on AM6254 SoC which is shown in the middle. Connection of other parts like power supply, memory, storage, wifi, ethernet, and others is also clearly shown in the block diagram. This block diagram shows the high level specifications of the BeaglePlay hardware and the sections below this are going to show you the individual part in more detail with schematic diagrams.

BeaglePlay System Block Diagram



System on Chip (SoC)

[AM62x Sitara™ Processors](#) from Texas Instruments are Human-machine-interaction SoC with Arm® Cortex®-A53-based edge AI and full-HD dual display. AM6254 which is on your BeaglePlay board has a multi core design with Quad 64-bit Arm® Cortex®-A53 microprocessor subsystem at up to 1.4 GHz, Single-core Arm® Cortex®-M4F MCU at up to 400MHz, and Dedicated Device/Power Manager. Talking about the multimedia capabilities of the processor you can connect up to two display monitors with 1920x1080 @ 60fps each, additionally there is a OLDI/LVDS (4 lanes - 2x) and 24-bit RGB parallel interface for connecting external display panels. One 4 Lane CSI camera interface is also available which has support for 1,2,3 or 4 data lane mode up to 2.5Gbps speed. The list of features is very long and if you are interested to know more about the AM62x SoC you may take a look at [AM62x Sitara™ Processors datasheet](#).



[Design and Specifications](#)

[Software Images](#)

Resources

- [Forum discussion](#) »
- [Hardware design repository and bug tracker](#) »
- [Linux repository](#) »
- [Documentation repository](#) »

- [CC1352P7 firmware repositories](#) »
- [Other related git repositories](#) »