Lattepanda

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Introduction

Origins of microprocessor and microcontroller, It can be traced back to the MOS integrated circuit, an integrated circuit chip developed in the early 1960s. By 1964, MOS chips achieved higher transistor density and lower manufacturing costs than bipolar chips. The application of MOS LSI chips to computing formed the basis of the first microprocessors as engineers began to realize that a complete computer processing system can be found in several MOS LSI chips.

The first multi-chip microprocessors were developed with more than one MOS LSI chip. The first single-chip microprocessor was the Intel 4004, released in 1971. One of the first recognizable modern embedded systems was developed for the Apollo spacecraft and missiles.

Since these first implementations in the 1960s, the price of embedded systems has fallen and there has been a dramatic increase in processing power and functionality. The first microprocessor, the Intel 4004 (released in 1971), was designed for calculators and other small systems, however, it still needed external memory and support chips. In the early 1980s, memory, input and output system components were integrated into the same chip as the processor that created a microcontroller. Microcontrollers find applications where a general purpose computer would be very costly. As the cost of microprocessors and microcontrollers fell, the prevalence of embedded systems increased (“LattePanda alpha,” 2018).

In the historical process of microcomputer production, the 1960s passed with the use of electronic circuit elements and in the 1970s, computers became very fast with the use of microchips created by combining integrated circuits.

There has been a serious increase in applications on embedded systems in recent years. Single board computer systems are frequently preferred in embedded system applications due to their easy-to-use, low cost and small size features. They can communicate with other devices or sensors through communication interfaces. Thus, they are used in robotics, internet of things, health, computer vision and smart home systems. They are

also selected for product development in the industrial field and prototype development in the academic field.

After ARM (Advanced RISC Machines) processors, LattePanda development board entered the mini computer market. It is a single board computer technology. This board offers the most advanced possibilities of mini computers. Although there are all kinds of necessary entries on a computer, Windows 10 is installed and operations that cannot be done with Raspberry pi 3 can be done with this card of the same size.

LattePanda card development team started work in 2015. It reached thousands of supporters via the Kicksarter platform in December 2015. Supported by the production of DFRobot, LattePanda team delivered the first generation products in March 2016. LattePanda R&D team continues to support further technology development possibilities. So much so that in 2017, it launched the LattePanda Delta and then the LattePanda Alpha. Today, LattePanda team continues to develop versions of Alpha ("Documentation," t.y.).

While LattePanda only supports Windows operating system in its first version, later versions Alpha 800 and Alpa 864 support Linux operating system. In addition, Alpha, which is released today, uses the same Intel processor class found in the MacBook.

Windows 10 comes licensed and installed. Since LattePanda contains Arduino board, it is a combination of a computer with Windows and an Arduino board. Thus, when there is a need for multimedia and performance, an atom processor, precise timing, PWM, and an Arduino microcontroller for analog input and hardware needs are used (Aydemir, 2018).

It is a combination of the operating systems supported in LattePanda and the Arduino board. It uses the Arduino IDE to program the Arduino and comes with the Arduino program installed. It also enables the use of large applications such as Visual Studio and Office to program the system.

LattePanda is used in many different project areas from robots to security systems, from system programming to playing games. With the 4K support on the device, a wired or wireless keyboard or mouse can be connected and allows surfing on the internet. In addition, since it has an Arduino board, it has the ability to do all the operations that can be done with this card.

By using LattePanda, there is an opportunity to become a Windows developer, IoT developer, interactive designer, robotics expert. In addition to the internal graphics card in the card, the desired card can be installed. The ability to install a second operating system on the card is another advantage of LattePanda. It supports the full version of Ubuntu as well as the full version of Windows 10 ("LattePanda alpha," 2018).

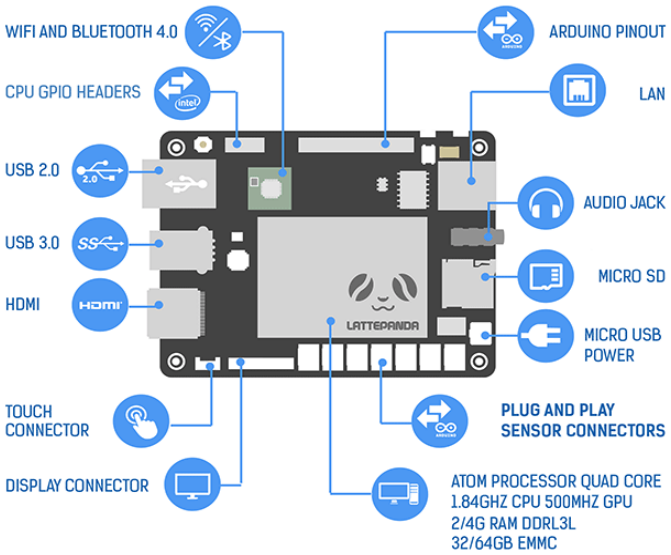

Figure 1. LattePanda Components

LattePanda Cards and Features

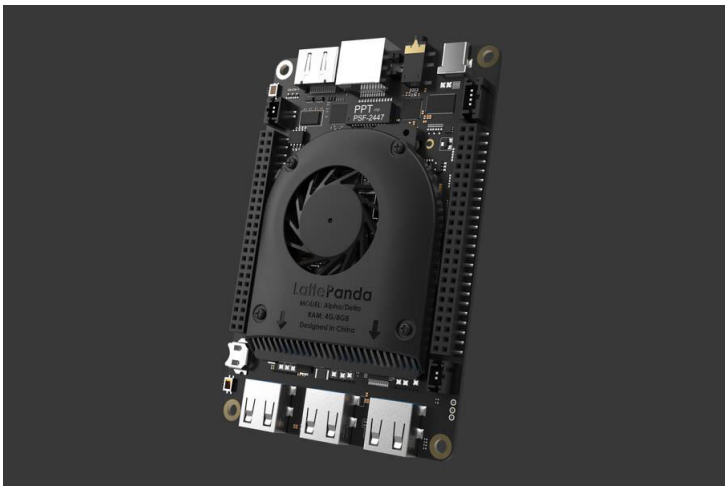

Figure 2. LattePanda Alpha

LattePanda is a complete Windows 10 single board computer. It has everything a normal computer has and can do everything a normal computer does. It is compatible with almost every device you know: printers, joysticks, cameras and more. All peripherals running on computers will run on a LattePanda.

LattePanda is a high performance palm-sized single board computer with low power consumption, running the full Windows 10 or Linux operating system. Edge computing, vending machine, advertising machine, industrial automation etc. It is widely used in its fields.

Whether you are a Windows developer, Internet of Things developer, system integrator or solution provider, LattePanda is the powerful development board that can speed up

your production rate.

LattePanda Alpha and Delta are the latest versions. While the former has top performance, the latter has a perfect balance of design, performance and price. Besides the latest motherboard, the LattePanda V1 is a good choice for industrial customers given its maturity and stability. In addition, various accessories such as touch screens, cables, cooling fans, cases and more can be supported.

LattePanda comes preinstalled with the full version of Windows 10 Home Edition so it can run on powerful tools like Visual Studio, NodeJS, Java, Processing and more. With existing APIs, original software and hardware projects can be developed on a LattePanda just like on a normal PC. (C#, Javascript, Ruby, etc.)

A LattePanda also includes an integrated Arduino compatible co-processor, which means it can be used to control and sense the physical world. Whether you are a Windows developer, IoT developer, DIY fanatic, interactive designer, robotics expert or maker, a LattePanda single board computer can assist in creative processes.

In terms of processor, all versions of LattePanda now come with an upgraded CPU. (Intel Z8350 - up to 1.92GHz)

LattePanda has three different versions. These versions are 2G / 32GB, 2GB / 32GB and 4G / 64 GB respectively. In addition, the 4G / 64GB version offers support for 64-bit Windows 10 used on personal computers. Due to the 4K support of the device, it can also be used with a wired or wireless keyboard and mouse. While Windows cannot be installed on the Raspberry PI, which is the closest Arduino board, this is the biggest privilege of this device. However, despite all this, of course, it would be wrong to expect a performance like a normal computer from this device. However, it can be used easily in many different projects from robots to security systems. If desired, different operating systems such as Linux can be installed. It even supports the installation of a second operating system.

Technical features of LattePanda Alpha;

- Processor Intel Core 7 generations M3-7Y30, 2.6GHz
- 8GB dual channel RAM
- Compatibility with NVMe SSDs
- Supports Intel Dual Band Wireless-AC 3165 2.4G / 5G Wifi and Bluetooth V4.2
- 1.6-2.6GHz Dual Core

- Intel HD Graphics 615, 300-900MHz
- 1x M.2 M Key, supports PCIe 4x, NVMe SSD and SATA SSD
- 1x M.2 E Key, supports PCIe 2x, USB2.0, UART, PCM

Delta Edition uses 8th generation Celeron N4100 processor, features as the main robot controller, interactive project core, IoT edge device or AI brain. LattePanda Delta is an x86 based SBC design. It has dual operating system support. It allows efficient code writing with the advantage of more than one operating system. Thanks to its ultra-thin design, it minimizes the space holding. It also has superior networking ability in the cloud and objects.

Technical features of LattePanda Delta;

- CPU : Intel 8th Generation Celeron Processor N4100
- Core : 1.1-2.4GHz Quad Core , Four Thread
- Benchmark (PassMark): up to 1800+
- Graphics :Intel UHD Graphics 600, 200-700MHz
- RAM : 4G LPDDR4 2400MHz Dual Channel
- Memory : 32GB eMMC V5.0l
- External memory:
- 1x M.2 M Key, supports PCIe 2x, NVMe and PCIe SSD
- 1x M.2 E Key, supports PCIe 2x , USB2.0, UART
- Connectivity , WIFI 802.11 AC, 2.4G and 5G
- Dual Band Bluetooth 5.0
- Gigabyte Ethernet
- USB Ports :3x USB 3.0 Type A
- Supports 1x USB Type C, PD, DP, USB 3.0
- Display : HDMI Output
- Type-C DP Support

- Expandable eDP touch screens
- Co-processor :Arduino Leonardo
- Operating System Support : Windows 10 Pro Linux Ubuntu

Picture					
Name	LattePanda Delta 432	LattePanda Delta 432	LattePanda Alpha 800s	LattePanda Alpha 864s	LattePanda Alpha 864s
Storage	4GB+32GB	4GB+32GB	8GB+0GB	8GB+64GB	8GB+64GB
License	NO	YES	NO	NO	YES
CPU	Intel Celeron N4100	Intel Celeron N4100	Intel Core M3-8100Y	Intel Core M3-8100Y	Intel Core M3-8100Y
Price	**$188**	**$228**	**$379**	**$409**	**$449**

Figure 3. Comparison Table of LattePanda Models

1. LattePanda Setup ("Documentation," t.y.)

There are two different power supply interfaces to power the LattePanda 1st Generation. The first is the widely used microUSB port. The other is any of the 5V GND (ground) pins, all labeled "CN2 Header Pins" on the board.

MicroUSB port is more suitable for desktop development scenarios.

The CN2 Header Pin is a good power supply for embedded applications that have limited space but provide a more stable, more powerful power supply for the system (with higher amps to supply enough current at about 3 ~ 4 Amps to sense the system simultaneously).

The current required for a LattePanda with full compute load is about 1.6 Amps. However, when restarting the system, the required peak current is about 2 Amps.

Requiered External Hardware

- USB Wall Adapter up to 2A Output
- Quality MicroUSB Cable (capable of 2A current)
- HDMI cable
- Cooler or Active Cooling Fan (required for advanced applications)
- Other General Purpose Computer Peripherals

- Monitor with HDMI Port or MIPI Display from LattePanda
- Keyboard and Mouse (Windows Ease of Access keyboard that comes preinstalled on your Windows OS device can also be used if it has a touchscreen)
- The LattePanda is powered by the microUSB port. Any standard USB adapter (such as mobile phone wall charger) with at least 2A current can be used as a power source for the LattePanda. A power adapter is not included with the motherboard.

Plug the USB into the USB power adapter and the microUSB into the LattePanda's microUSB port. (The microUSB port is next to the SD card slot).

1. If there is a need for IPS screen and touch panel, please install it first. Figure 3.

Figure 4. Installing the Display Plug

2. When inserted, you should see the red LED indicator light on the underside of the board. This means LattePanda is launched. Wait patiently for a few seconds until the LED goes out. Figure 4.

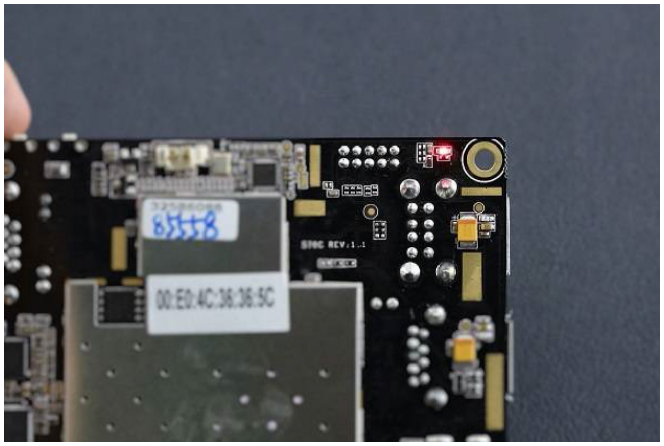

Figure 5. Launching LattePanda

3. When the LED is off, press and hold the power button for one second to turn on the LattePanda. You should see the LED light up again. Figure 5.

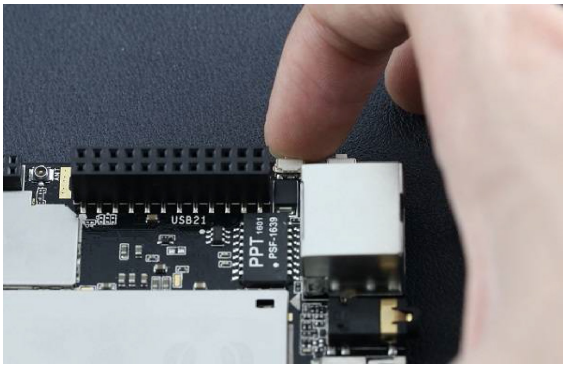

Figure 6. Opening LattePanda

4. Connect peripheral device to your device.

LattePanda is compatible with a wide variety of peripheral devices. You can connect any USB powered device such as flash drives, mouse and keyboard, or a webcam to USB 3.0 and 2.0 ports. SD card socket supports extra storage from miniSD card. You can also connect the LattePanda to an external speaker device via the 3.5mm audio jack.

LattePanda's Arduino-compatible co-processor with plug-and-play heads and GPIO pins supports standard 5V sensors and actuators that allow it to interact with the physical world.

Connect to the Wi-Fi network:

1. Install the Wi-Fi antenna by inserting the rounded tip into the socket labeled "ANT" located next to the GPIO pins on the board.

2. In Windows, select a Wi-Fi connection by clicking the Wi-Fi icon in the system tray at the bottom right of the screen. Follow the wizard to make a connection.

3. Connect via 7" Screen and Touch Panel Layout. Figure 7.

Figure 7. Connecting to Windows

Contacts in the FPC are very compact and sequential. Please note that any dislocation connection may cause LattePanda short circuit and the IPS may cause abnormal display such as ghosting or flickering.

1. Lift the actuator. Figure 8

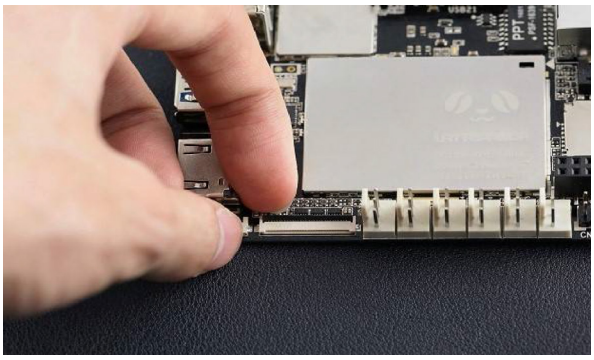

Figure 8. Actuator Connection

2. Place the display FPC.

3. Place the Gold Finger side down! Figure 9

Figure 9. FPC Connection

4. Turn the actuator down until it is tightly closed. Figure 10

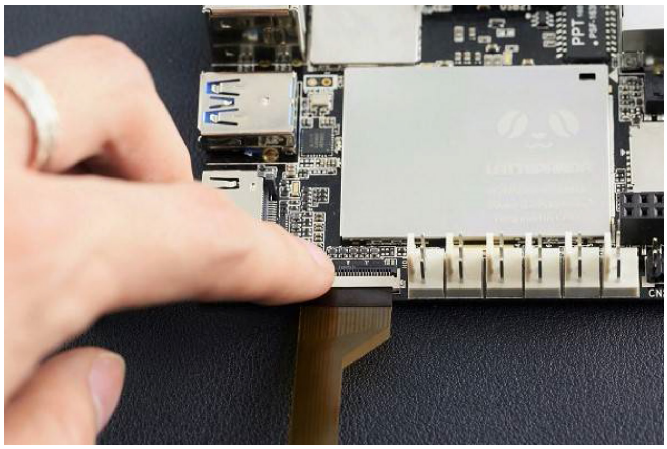

Figure 10. Socket Locking

5. Install the FPC of the touch panel same as the screen. Figure 11

Figure 11. Display and Panel FPC Connection

5. LattePanda Applications

Analyzes and experiments need to be portable to meet mobile data collection needs in the medical field. One of the key advantages here is LattePanda, a Windows 10 computer. Data from this device provided the same reliability as laptops. This device is inexpensive compared to notebook computers and provides a richer variety of media for experiments and analysis (Kuziek et al., 2018).

In recent years, data sharing with the IoT technique has become more attractive in the healthcare industry. Single board computers play a big role in data collection and sensor management. LattePanda is the single board computer that is cheaper, faster and capable of large data storage (HadiShanoer et al., 2020).

It can be used in LattePanda as a high performance card that will support the operations required by security and object recognition technology (Nacipucha et al., 2020).

A single board computer is a complete computer built on a single circuit board with microprocessor, memory, input / output (I / O) and other features required by a fully functional computer. Single board computers can be used to create rapid development systems, various education systems and as embedded robot controllers. Most single board computers have great connectivity options and peripherals not common for desktop / server PC systems.

LattePanda performs well but has various setup and stability issues. The multimedia playback experience is far behind other cards. Also, high heat dissipation and fan requirements are disadvantage for this SBC. Of course, it can fit some niche applications when computing requirements are important, the X86-64 architecture allows all PC-based operating system software packages to be used (Paunski & Angelov, 2019).

The LattePanda motherboard is a Windows-based edge computer designed to run

Windows 1064 bits on a 5inch motherboard. It has an Intel Atom microprocessor and 4GB of RAM memory that allows it to run different applications such as Matlab or run as a server for networked system applications. For the remote lab platform, the LattePanda board is used not only to run Matlab in Loop-in-Hardware configuration (HIL) for the system's local control scenario, but also as a installer for the remote control scenario. In addition, the Arduino card connected to the LattePanda provides great convenience and performance in applications (Viola et al., 2020).

The data obtained from the image and distance sensors used in object recognition technology was developed on a single board computer (LattePanda), which is the most useful for mobile applications, and the software was developed on a C ++ platform (Visual Studio 2017, Microsoft, USA). This is a great advantage for agricultural applications (SooKim et al., 2021).

Devices such as Intel LattePanda, which allow a large number of weak computing devices to share the workload in simulation applications, generally have lower cost and higher power efficiency (Rui et al., 2019).

Results

In a time when mobility is very high in the world of single board computers, the relatively small but high performance LattePanda card has become important in all industrial applications. The most important output of this board is its price advantage, performance and powerful output pins, as well as the ability to manage computers by connecting remotely and to make additional and complex applications in a simple way thanks to the Arduino board on it. Of course, it is obvious that it will not be sufficient for every application, as is the case with every card. However, as the studies on it increase, the card can be improved. It has high application performance for now.

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