SUNPLUS

Tibbo TECHNOLOGY

Plus1 Application Processor

The power of Linux. The simplicity of a microcontroller.

Presented by Dmitry Slepov, Managing Director and Co-Founder of Tibbo Technology Inc.

FACT:
Most chips employed in IoT applications today were designed for unrelated uses

Raspberry Pi

Broadcom CPU

Original target market?
SET-TOP BOXES!

FACT:

Compared to Linux CPUs, modern microcontrollers are:

- Easier to integrate into the customer's hardware
- Require cheaper boards with only 2 or 4 layers
- Equipped with more sophisticated IO

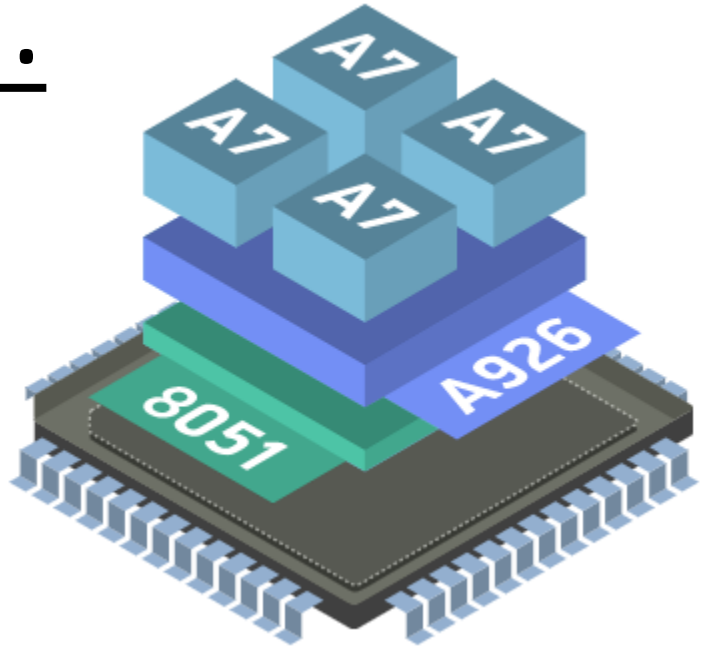
… So Tibbo team asked a question:

What if we created a new kind of Linux chip–
an IC targeting the IoT/industrial control market and
combining the best features of popular microcontrollers
and powerful Linux chips?

In late 2018
Sunplus Technology and Tibbo Technology
have joined forces to create
this new kind of embedded Linux chip.
Thus, the **Plus1** Application Processor was born.

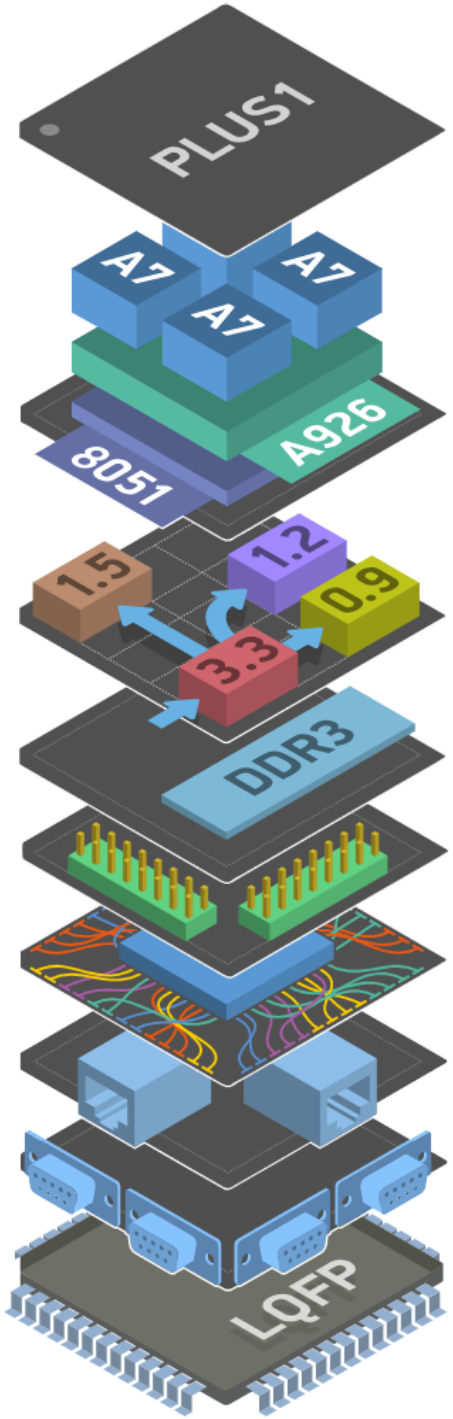
Plus1 was released at the end of 2019.
Let’s look at its main features…

First off, it's a…



Balanced mid-range processor for IoT/control application:

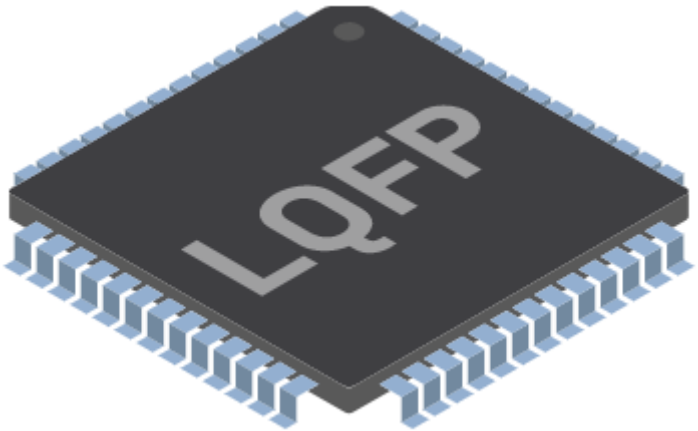
- Quad-Core 1GHz Cortex-A7 CPU
- NEON multimedia processing engine
- Additional A926 core for running real-time tasks
- Low-power 8051 core for running supervisory tasks



This is great, but it’s not the main point…

Let’s now review the features that make Plus1 **stand out** in the crowded CPU space.

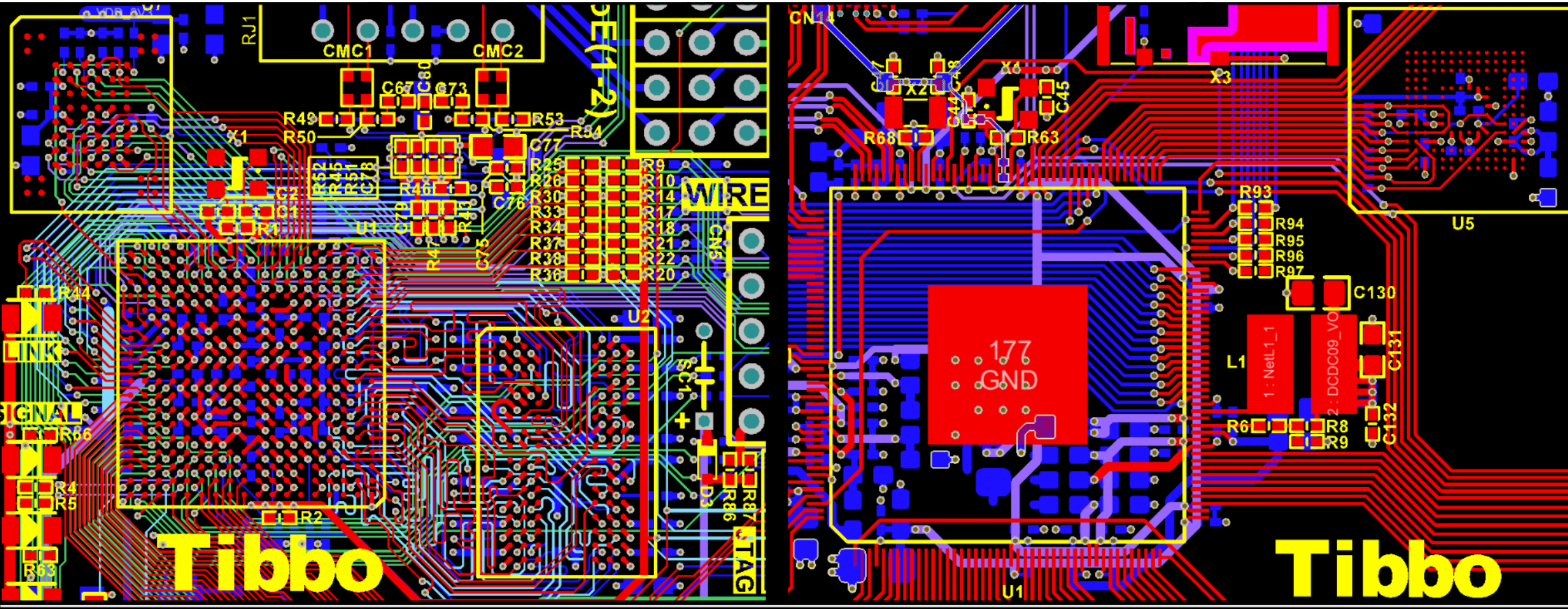
Feature 1



Easy-to-use LQFP package:

- Simplifies board layouts
- Lowers board costs (only 2 or 4 layers needed)
- Makes the manual soldering possible—great for making samples
- Simplifies repairs—no expensive rework equipment needed

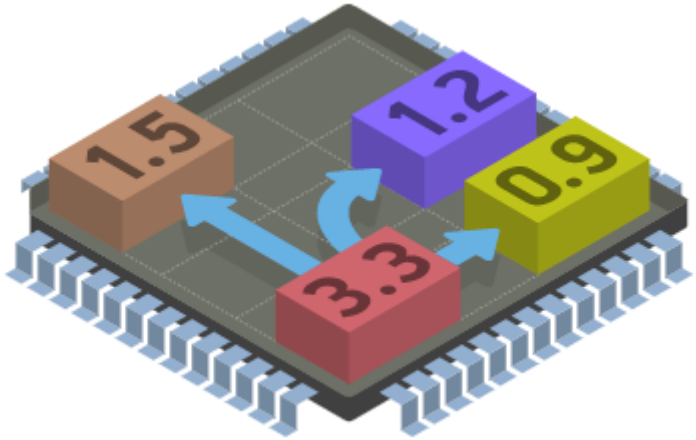
Just how different is the layout for BGA and LQFP chips? Well, here is a simple visual comparison…



TI AM335x-based design. 6-layer board. Wire hell.

Plus1-based design. 4-layer board. Simple as a microcontroller circuit.

Feature 2

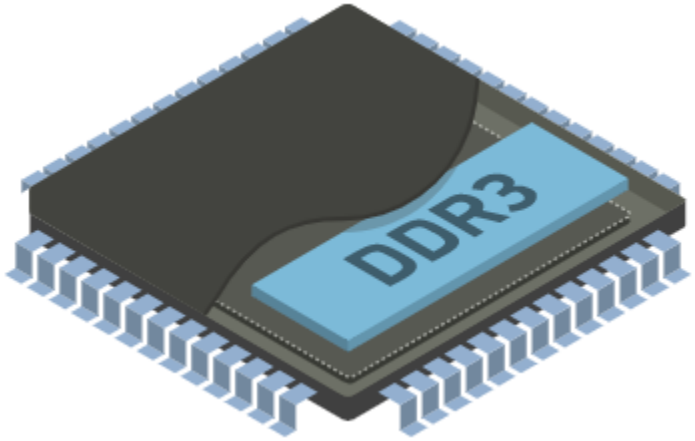


Single 3.3V Power:

- No expensive and complex companion PMICs needed
- All additional voltages are generated on the chip*
- Only passive external components must be added

* *Some limitation apply*

Feature 3

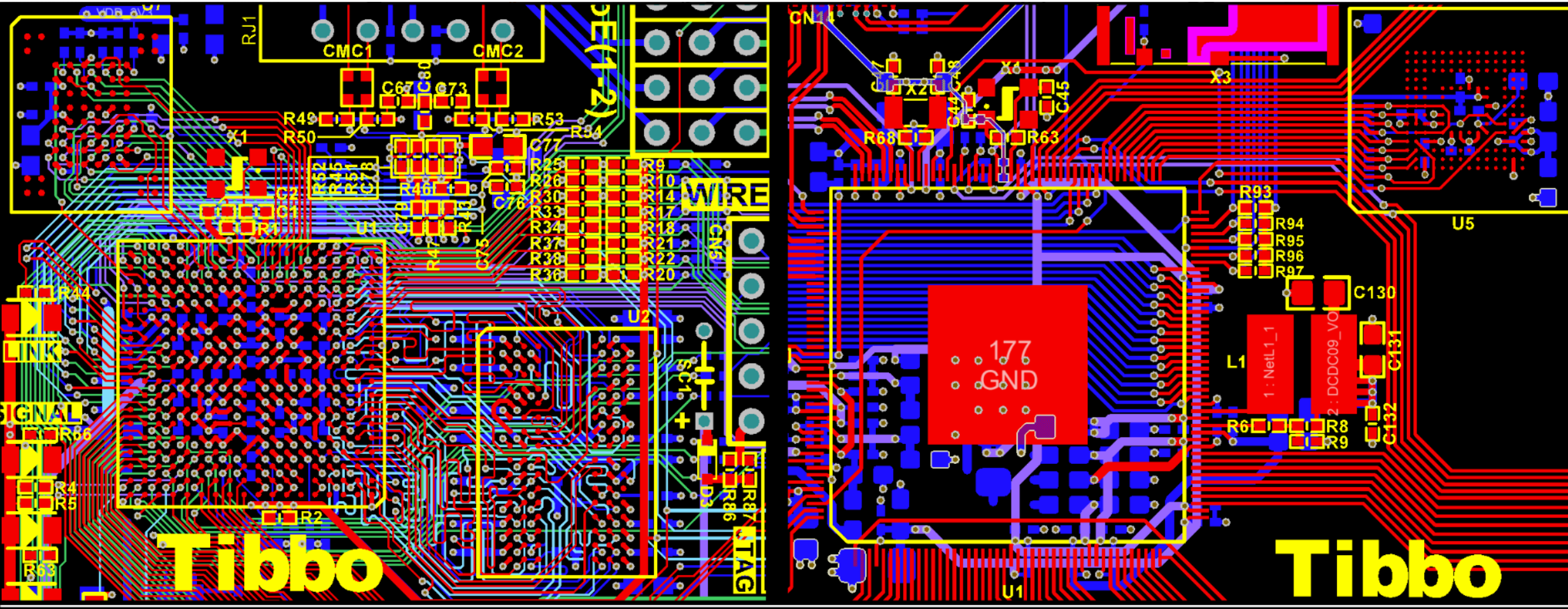


Integrated DDRAM (512MB standard, 128MB on request):

- Lower pin count > LQFP package possible >Simpler layouts > Fewer board layers > Lower board costs
- DDRAM onboard > Fast layout jobs, reduced debugging
- DDRAM onboard > Fewer procurement headaches

Coming back to that “BGA” vs. “no BGA” comparison…

Here is what having external memory vs. having it on the chip means:



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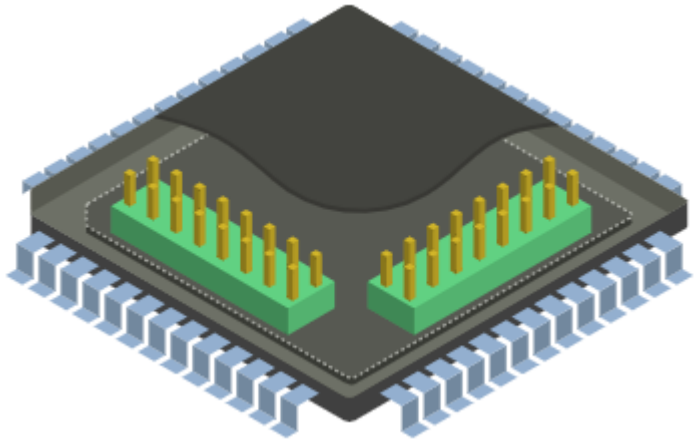
Feature 4

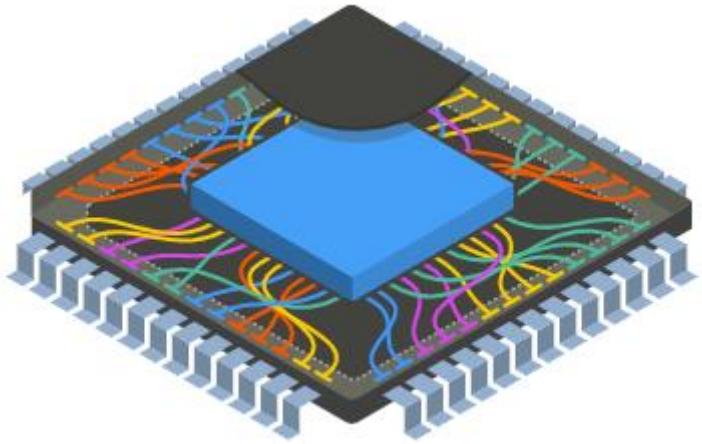


5V-tolerant IO lines:

- Allows interfacing directly to 5V logic
- This feature is common on small micros, unheard of on Linux-class chips*

** Are you starting to see the pattern here?*

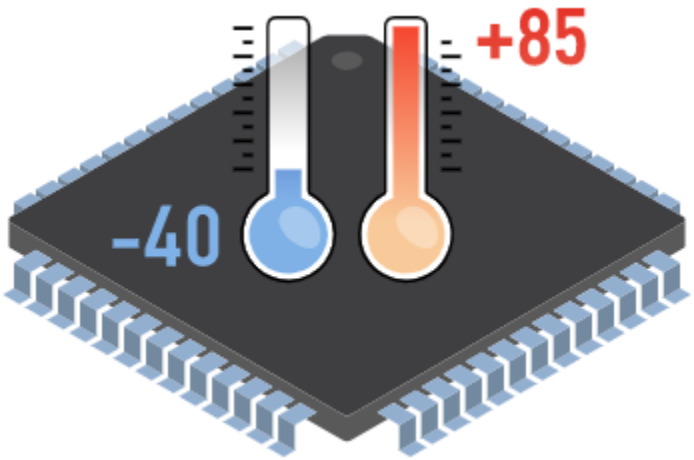
Feature 5



PinMux: Flexible peripheral multiplexing:

- Connect any IO of a participating peripheral to any pin
- Common on small micros, rare on Linux-class chips
- Unlike other chips, our PinMux is fully symmetrical
- PinMux can be adjusted **at run-time**, no reboot required

Feature 6



Industrial temperature range: -40…+85C*

** Lower-cost commercial-grade variant available on request*

Feature 7

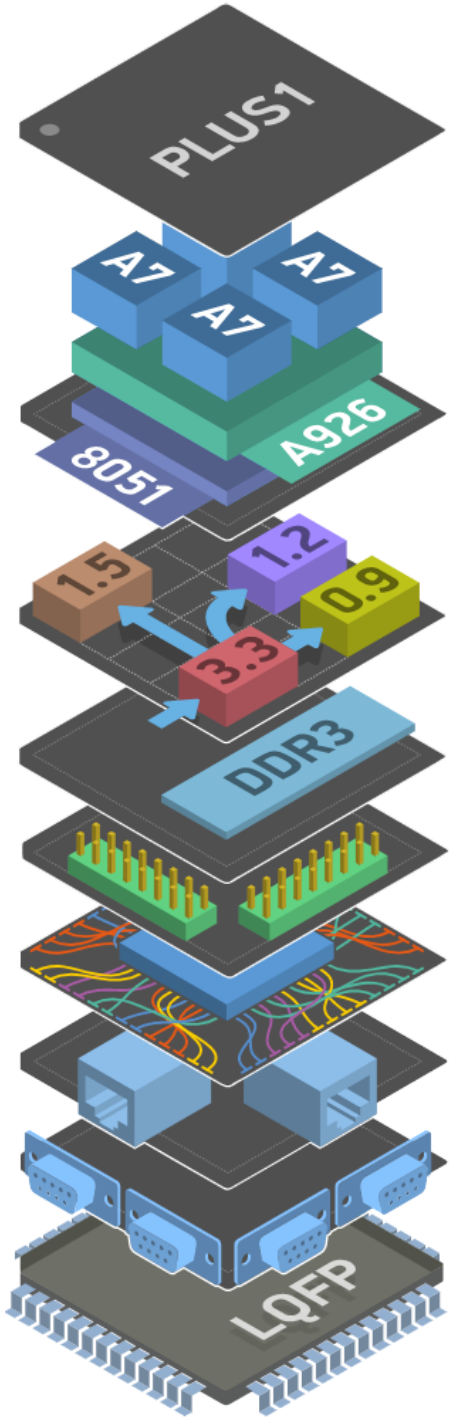
Industrial products have long lives. Using consumer-oriented chips in industrial products creates major **procurement risks**!

Plus1's supply guarantee alleviates supply concerns.

Bonus point!

Also, consider that…

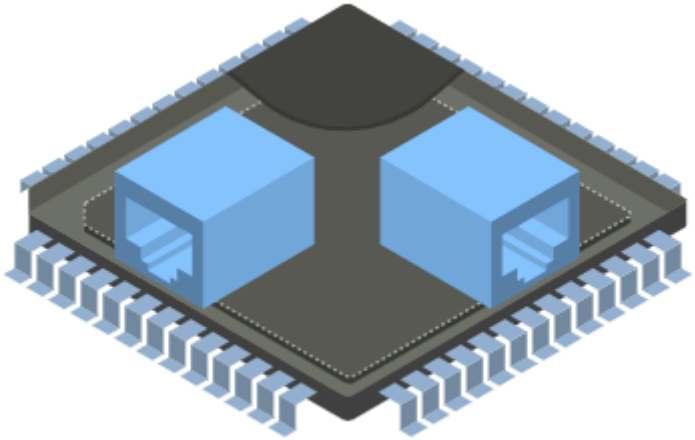
- The chip was designed and is being made in Taiwan
- This guarantees stability, sane vendor attitude, and..
- KIND SUPPORT!
- This is also a major plus in today’s trade war environment



There were 8 major selling points…

…But wait, there is more!

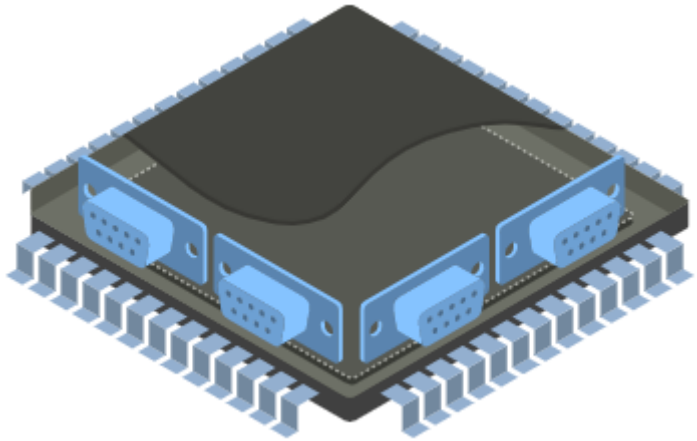
Dual Ethernet



Dual PinMuxable Ethernet MACs:

- Built-in unmanaged 3-port switch
- Easy Ethernet daisy-chaining of Plus1-based devices (very popular in the industrial control space!)
- MACs can also be configured as two independent ports

UARTs, SPIs, I2Cs



Ample UART, SPI, and I2C ports:

- 4 x PinMuxable UARTs with 128-byte TX and RX FIFOs
- 4 x PinMuxable SPI ports with 8-byte TX and RX FIFOs
- 4 x PinMuxable I2C ports with 32-byte TX and RX FIFOs

More ports

And more ports/peripherals:

- Flash interface (eMMC, SPI NAND, SPI NOR)
- PinMuxable SD2.0 interface
- PinMuxable SDIO (SD2.0) I/F for connecting a Wi-Fi/BT module
- Two OTG USB2.0 ports with Linux boot, USB video class support
- Two PinMuxable 4-channel PWM modules
- Four PinMuxable timers/counters
- Four PinMuxable capture modules

Multimedia

And some basic multimedia features:

- MIPI-CSI camera interface for up to two cameras
- MIPI video interface
- HDMI 1.4 video interface for connecting monitors
- TFT LCD controller with a parallel bus interface
- I2S/SPDIF/PWM audio output for up to five channels
- PDM interface for an 8-channel MEMS microphone array

More stuff!

Plus all this:

- 32-bit FPGA bus IO (FBIO) interface
- Internal temperature sensor
- RTC with wake-up function and backup battery charging circuit
- 128-byte OTP memory for device IDs, MAC addresses, user data
- SWD and JTAG debug interfaces
- Console serial port
- Watchdog timer

Security

And finally, these important security features:

- Secure boot (boot image verified by ED25519 algorithm)
- PKA engine (RSA)
- Hash engine (SHA3, MD5)
- Encryption/decryption engine (AES)

Alright, but what about the software?

Plus1 is supported by a modern Linux distribution:

- Yocto-based
- Up-to-date (not always the case for other ICs)
- Build appliance (virtual PC for compiling) available
- Very compact (~40MB) Linux version in the works

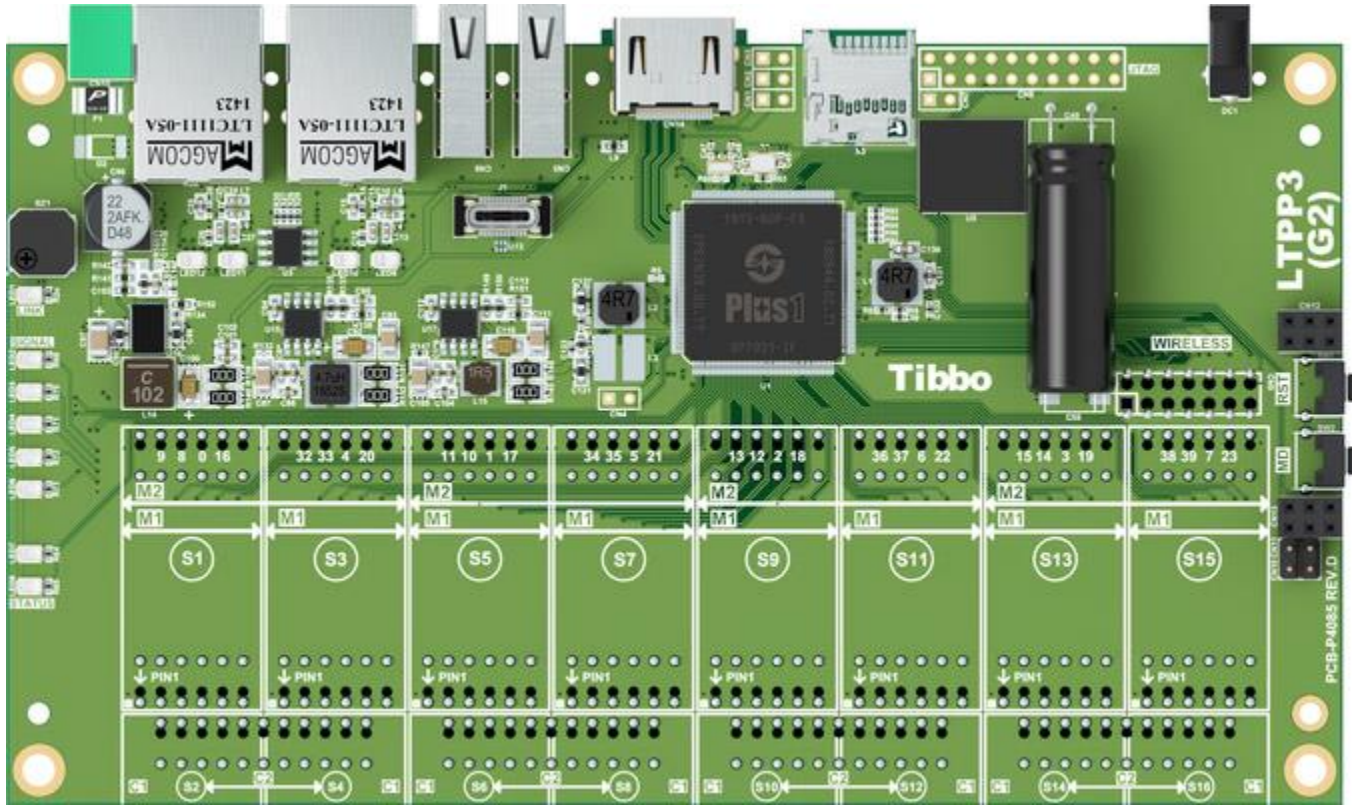
What can be built with Plus1?

- IoT products
- Data collection products
- Industrial devices:
  - Gateways
  - Protocol converters
  - Remote IO
  - Smart cameras (object recognition, measurements, …)
- Security/access control systems (incl. with facial recognition)
- Audio-centric consumer products
- And much, much more…

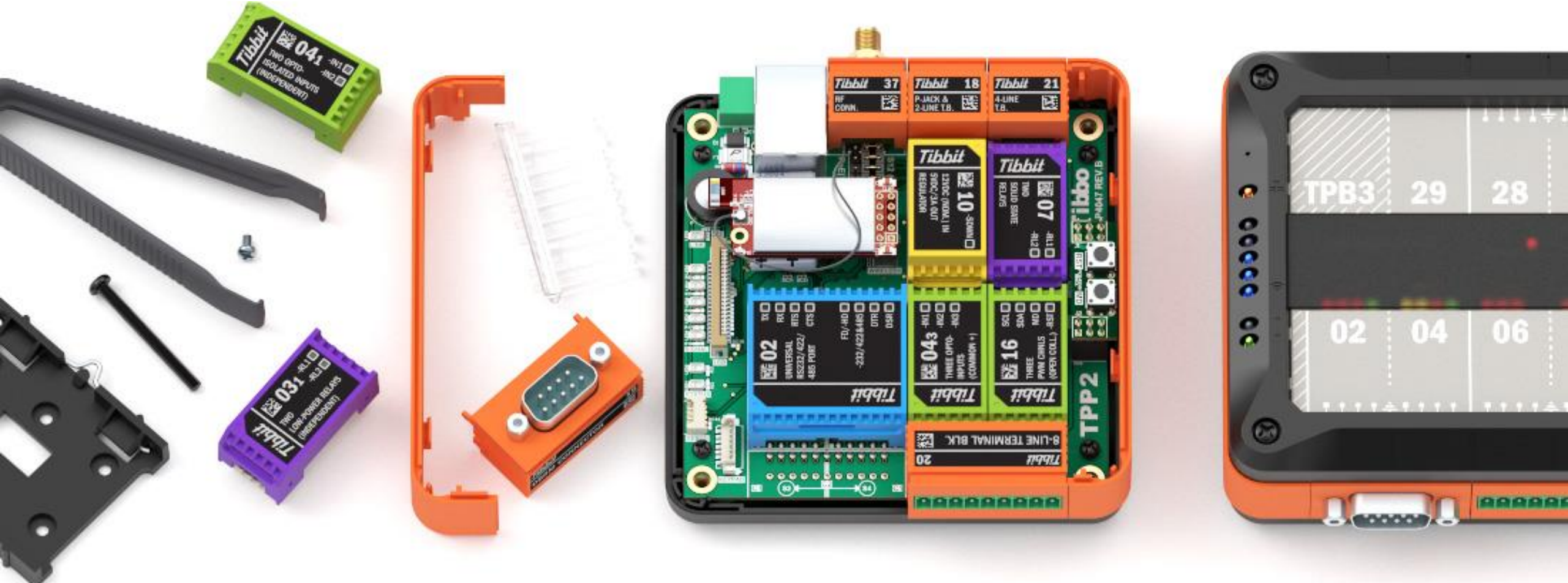
Pricing

- USD$20/chip for sample orders (512MB DDRAM/industrial temperature range version)
- Attractive volume discounts
- Coordinated price policy between Sunplus and Tibbo allows Tibbo to offer the same pricing as Sunplus
- When evaluating costs, look at the total BOM cost, as savings on fewer-layer boards and other components will result in an attractive total cost

For testing, we recommend the LTPP3(G2) board. This board is a part of our TPS product line.



For those of you who don’t know, TPS or Tibbo Project System is a modular automation platform featuring Tibbit™ modules and connectors.



What is Tibbo's role in promoting and selling PLus1?

Tibbo is designated Sunplus' Preferred Technology Partner:

- Tasked with building Plus 1 distribution channel
- Responsible for most of the Plus1 sales
- Coordinating technical support
- Actively participating in advancing the Plus1 platform

Thank you!