Ninestar’s Toner Cloning Was Just the Beginning—Now They’re Stealing Europe’s Microchip Designs.

By Tonernews.com, on 04 24 2026

STM32 parts are a family of microcontrollers produced by STMicroelectronics (STM32 Microcontrollers (MCUs) - STMicroelectronics), one of Europe’s largest semiconductor companies headquartered in Switzerland and France. They are among the most widely used embedded control chips in the world.

Geehy's, part of the Ninestar Group, APM32 products (https://global.geehy.com/product/third/apm32) seem to be exactly pin- and function-compatible with STMicroelectronics' STM32 parts (https://ipxchange.tech/product-news/pin-and-function-compatible-replacements-for-stm32-mcus-provide-second-source-remedy-as-shortages-continue/ and https://ipxchange.tech/product-news/pin-and-function-compatible-replacements-for-stm32-mcus-provide-second-source-remedy-for-st-chip-shortages/).

APM32F103 has been tested as a complete drop-in replacement for the STM32F103, with no changes required to PCB layout, firmware code, hex files, testing or production (https://www.cnx-software.com/2022/07/04/geehy-apm32f103-clone-of-stm32f103-mcu-has-been-tested-to-work-without-pcb-or-code-modifications/).

To make this possible, Geehy copied several technical interface layers used by STM32.

1. Pin compatibility

The electrical pins on the chip package are arranged exactly the same.

Example:

Pin 1 → power

Pin 2 → GPIO

Pin 3 → SPI

Pin 4 → ADC

Same pins → same PCB layout.

This means manufacturers do not need to redesign the circuit board.

2. Register compatibility

Microcontrollers are controlled by registers inside the chip.

Example register in STM32: GPIOA_MODER = 0x48000000

Geehy uses the same register addresses and structure, so firmware written for STM32 can access hardware the same way.

This is one of the most important compatibility layers.

3. Peripheral compatibility

Peripherals are built-in hardware modules such as:

- SPI
- I^2C
- UART
- timers
- ADC
- USB

Geehy implemented peripherals with the same functionality and memory layout as STM32. So drivers written for STM32 usually work with APM32.

4. ARM architecture

Both chips use ARM Cortex cores.

Examples:

- Cortex-M0+
- Cortex-M3
- Cortex-M4

Because the CPU architecture is identical, compiled firmware can often run unchanged.

However, the cloning may go deeper than just pinout compatibility. Analysis of the APM32's system ROM reveals it appears to contain maybe a copy of STMicro's bootloader, suggesting piracy of ST's embedded software, not merely a design clone.

What the bootloader is: Microcontrollers often contain a system ROM bootloader that is programmed by the chip manufacturer and cannot be changed by the user.

Its purpose is to allow firmware to be loaded into the chip through interfaces such as:

- UART
- USB
- CAN
- I^2C
- SPI

On STM32 chips, this bootloader is part of ST's proprietary firmware stored in internal ROM.

Engineers who tested the APM32F103 found several things that triggered suspicion:

1. Identical bootloader behaviour.

The bootloader command set appeared to behave exactly like the STM32 bootloader protocol (e.g. https://www.blaatschaap.be/identifying-32f103-clones/).

Example commands:

- GET
- GET VERSION
- GET ID
- READ MEMORY
- WRITE MEMORY
- ERASE

These commands match the STM32 bootloader interface.

2. Matching device responses

When communicating with the chip using STM32 programming tools, the APM32 responded with very similar responses and memory structures.

In many cases tools designed for STM32 could interact with the APM32 bootloader without modification.

3. Memory layout similarities

Reverse engineering reports indicated that the system ROM region and bootloader entry points appeared structured similarly to STM32F1 devices.

Flash & SRAM addresses — identical

Memory and register addresses are the same between APM32 and the STM32 counterpart, with new functions occupying the reserved address areas. So linker scripts, startup code, and firmware targeting 0x08000000 for Flash and 0x20000000 for SRAM will work without modification. (https://github.com/RobotDynOfficial/Documentation/wiki/APM32F103Cx-MCU-Board).

Summary:

So the Geehy APM32 MCUs have the same layout, memory map, peripheral support and performance as the equivalent STM32 part, with matching pin definitions in the same packages, and identical memory and register addresses. Hence, the APM32F103 is a near-clone of the STM32F103, designed as a drop-in replacement during the STM32 supply crisis. (see: https://ipxchange.tech/product-news/pin-and-function-compatible-replacements-for-stm32-mcus-provide-second-source-remedy-for-st-chip-shortages/).

Geehy is effectively replicating a Western-designed microcontroller family widely used in industrial, automotive, and defence applications globally. By producing a functionally identical domestic Chinese alternative, Geehy is enabling China's electronics industry (including military suppliers) to substitute away from Western-sourced chips without changing any existing designs or firmware.