BIGTREETECH TMC5160T Pro V1.0

BIGTREETECH TMC5160T Pro V1.0 Stepper Motor Driver Instruction Manual

Model: TMC5160T Pro V1.0

Product Overview

The BIGTREETECH TMC5160T Pro V1.0 is a high-performance stepper motor control chip designed for 3D printer applications. It operates via an externally enhanced power MOSFET, allowing for efficient power delivery and low heat development during operation. This driver is engineered to optimize drive performance, ensuring smooth, quiet, and energy-efficient motor control.

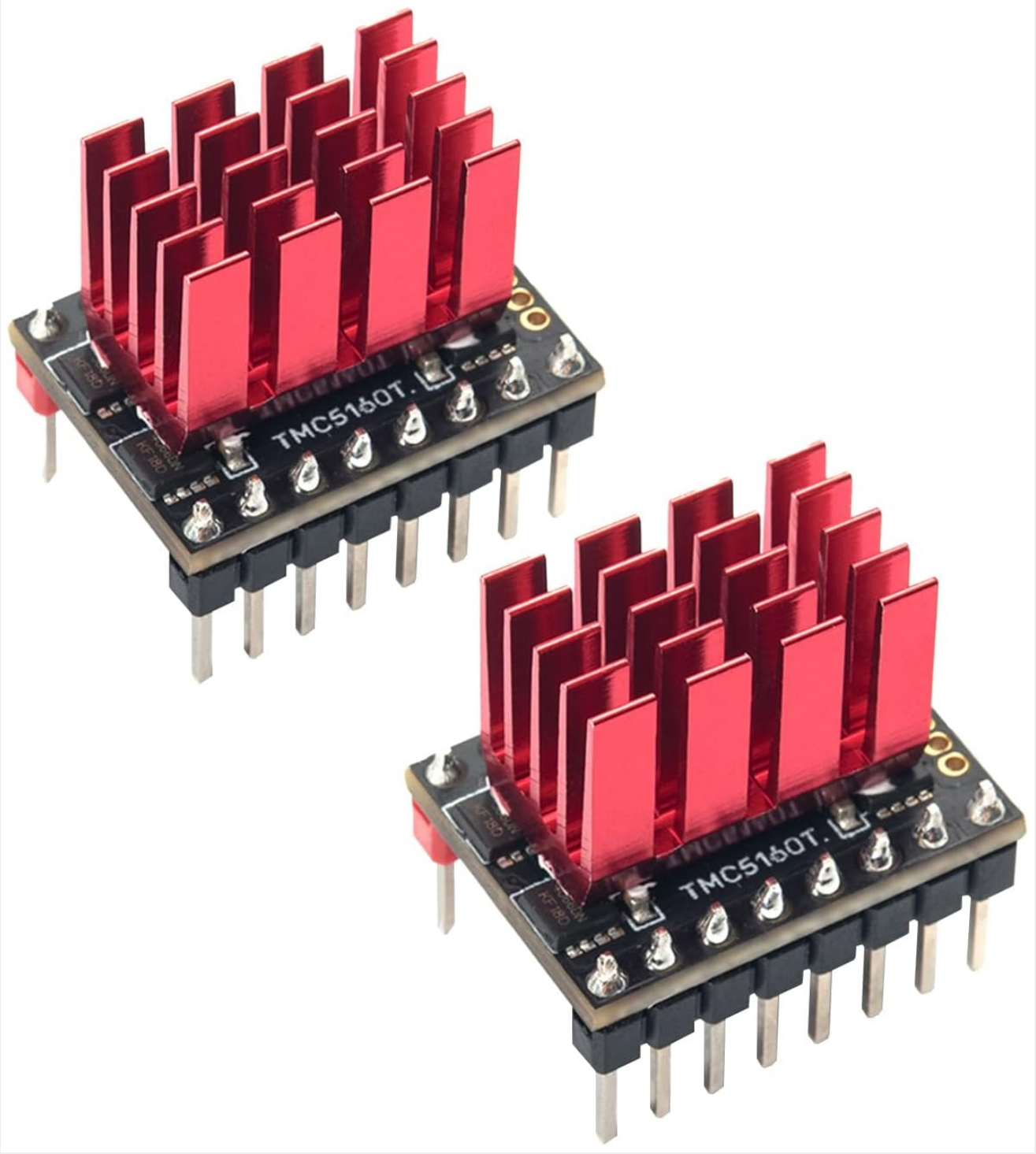

Figure 1: Two BIGTREETECH TMC5160T Pro V1.0 Stepper Motor Drivers.

Key Features

- **Driver Chip:** Utilizes the TMC5160T-TA chip, measuring 15.3 mm x 20.4 mm, for robust performance.
- **High Performance, Low Heat:** Operates with an externally enhanced power MOSFET, supporting a maximum current of 3A with minimal heat generation.
- **Optimized Drive Performance:** Incorporates TRINAMIC functions such as StallGuard2, coolStep, dcStep, SpreadCycle, and StealthChop for enhanced speed, motor torque, energy efficiency, smoothness, and quiet operation.
- **Wide Voltage Range:** Supports a power supply voltage (VM) from 8V to 56V (recommended not to exceed 48V for safety).
- **High Microstepping:** Capable of up to 256 microsteps for precise motor control.

- **Operating Modes:** Supports both SPI and SD operating modes.
- **Broad Compatibility:** Compatible with BIGTREETECH Octopus Pro, SKR V1.4 Turbo, SKR 3, Manta M4P, Manta M5P, Manta M8P 3D Printer control boards, and suitable for Voron 2.4, SV08, VZbot, CoreXY, and i3 series 3D Printers.

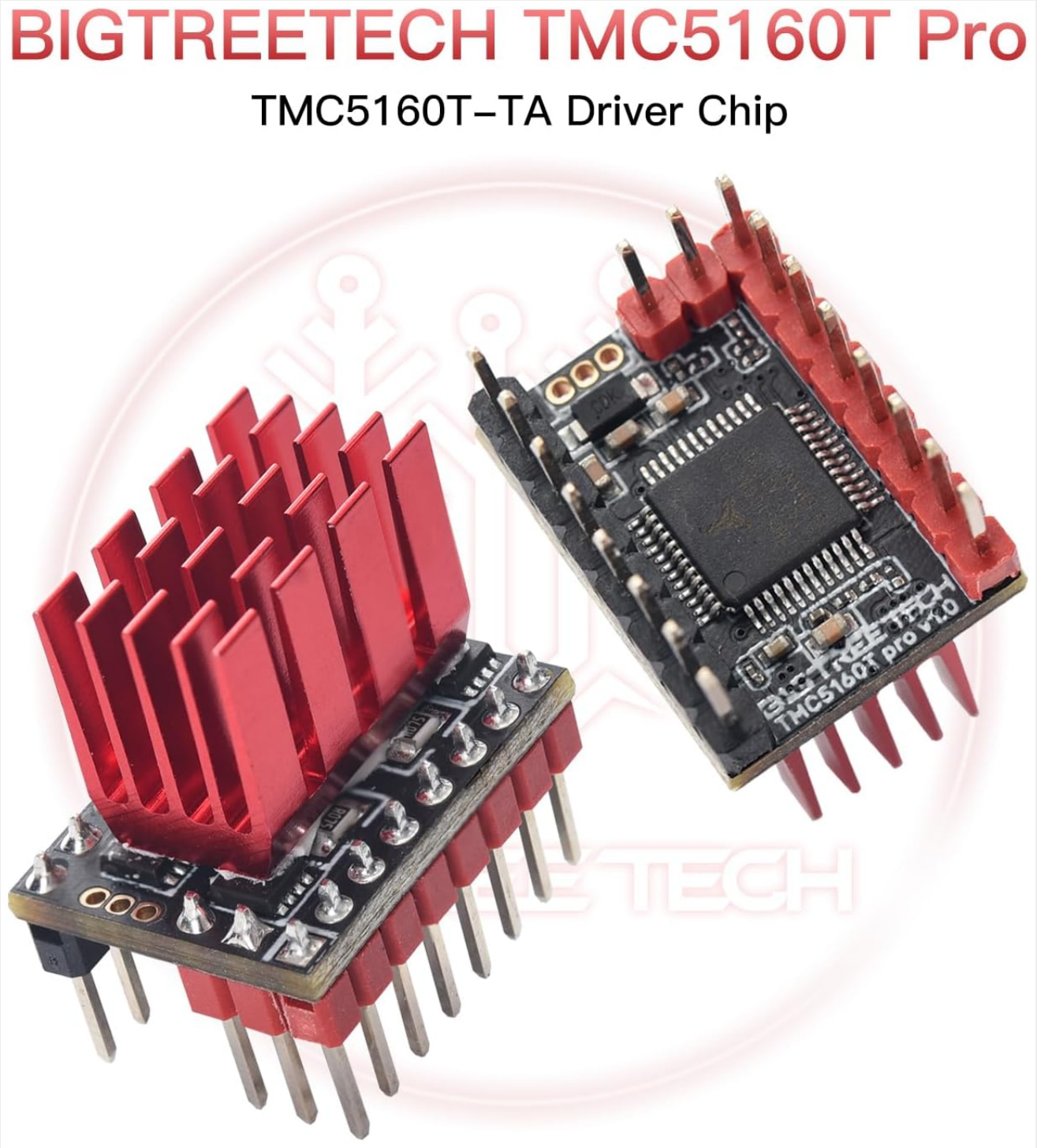

Figure 2: Internal view of the TMC5160T Pro V1.0 driver chip.

SPECIFICATIONS

Parameter	Value
Driver Chip	TMC5160T-TA
Product Dimensions	15.3 x 20.4 mm (approx. 0.8 x 0.6 x 0.9 inches)

Parameter	Value
Power Supply Voltage (VM)	8V - 56V (Recommended: 12V, 24V, 36V, 48V, 56V)
Maximum Current	3A (via 2.54mm single-row pins)
Maximum Microstepping	256
Operating Modes	SPI, SD
Material	PCB
Item Weight	4.54 g (0.16 ounces)

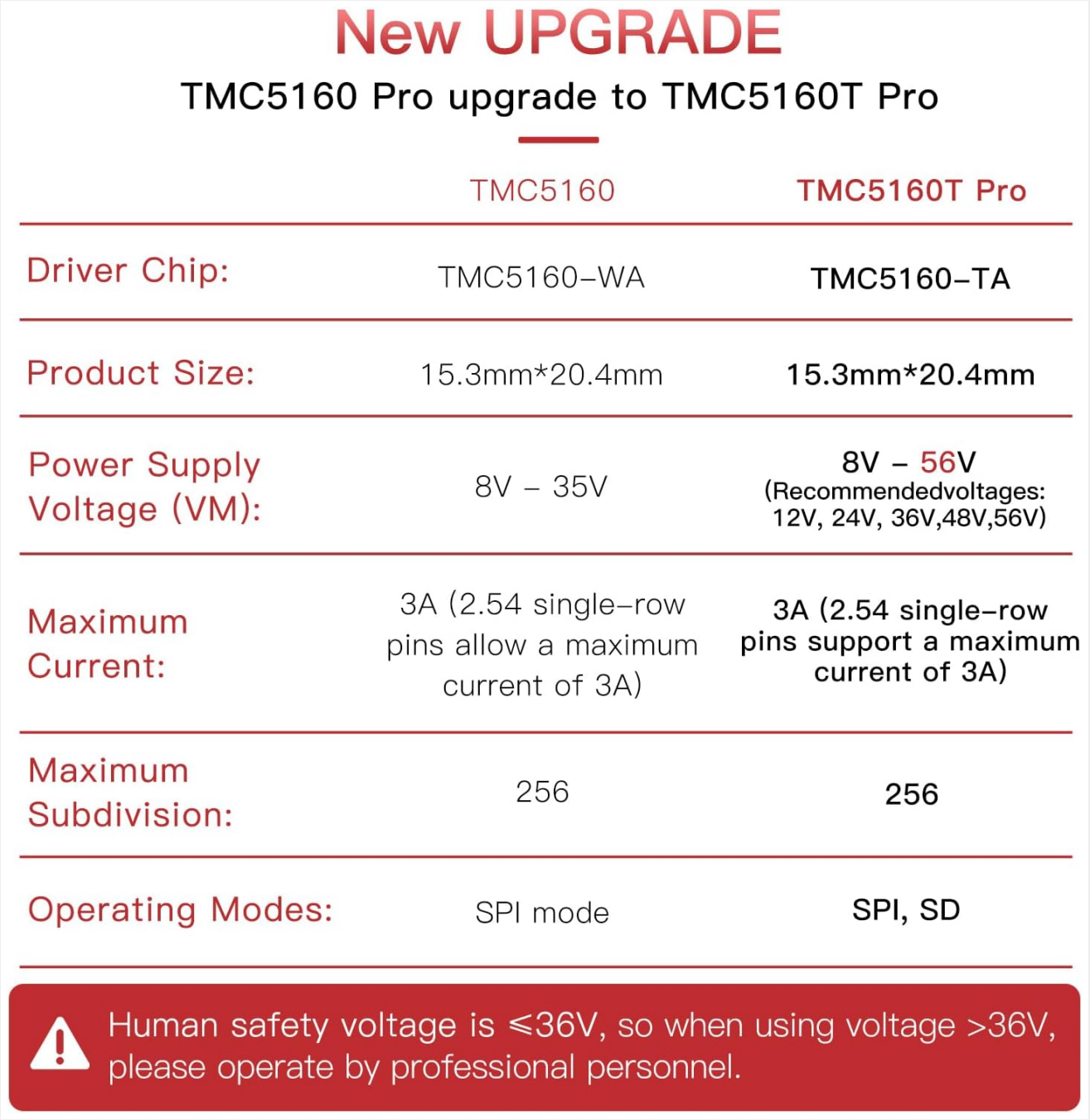

Figure 3: Specification comparison between TMC5160 and TMC5160T Pro.

Important Safety Note: The voltage deemed safe for human contact is ≤36V. Consequently, when utilizing voltages >36V, it is imperative to ensure that operations are conducted by certified professionals.

Setup and Installation

The TMC5160T Pro V1.0 stepper motor driver is designed for integration into compatible 3D printer control boards. Ensure your control board supports the SPI or SD operating modes required by this driver.

Pinout and Connection

Proper connection of the driver to the mainboard is crucial for correct operation. Refer to the pinout diagrams for the TMC5160T Pro V1.0 to ensure all pins are correctly aligned with your control board's stepper motor driver slots. The TMC5160T Pro V1.0 includes upgraded 3-pin pins to facilitate DIY encoder connections.

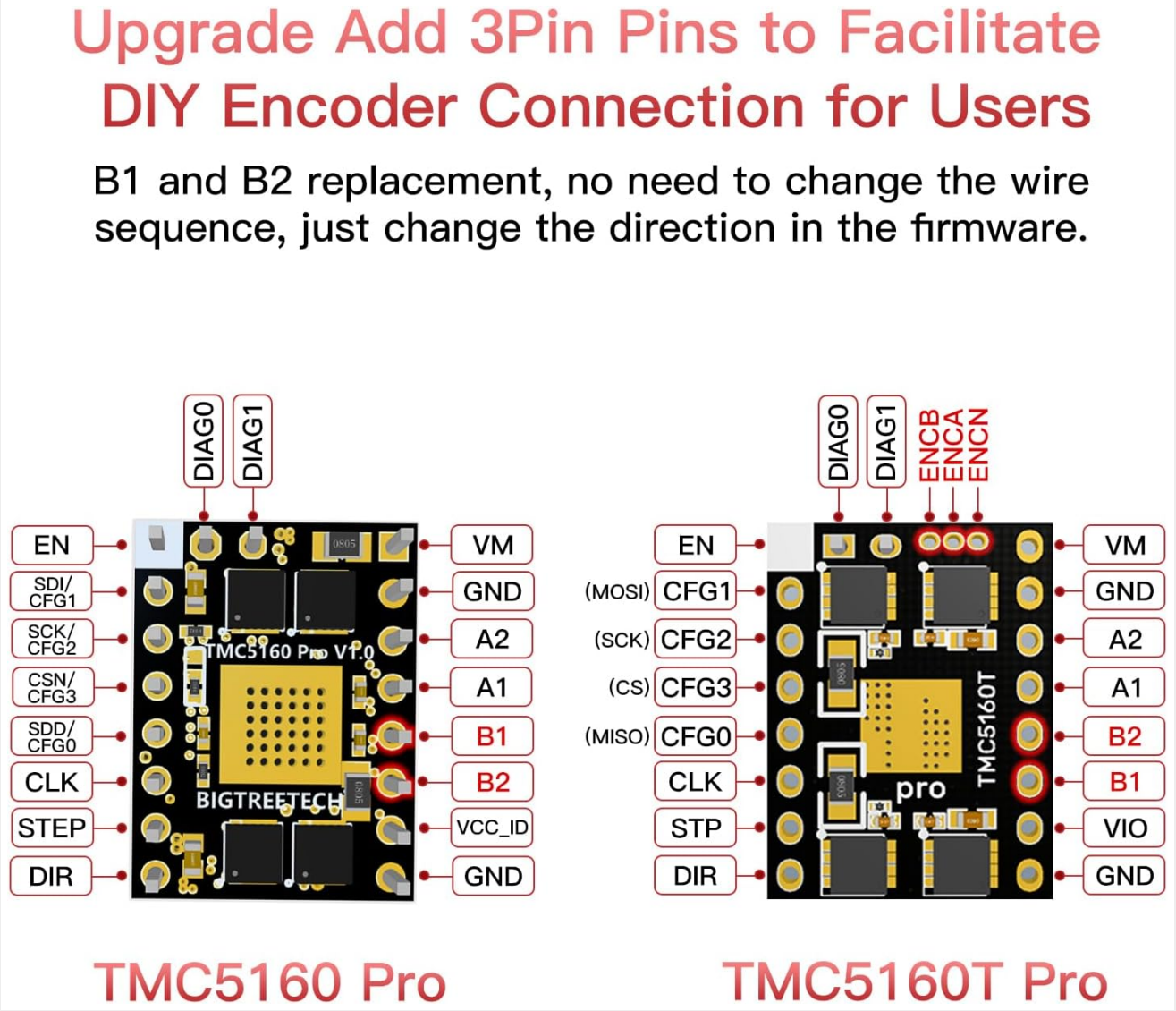

Figure 4: Pinout comparison and encoder connection points for TMC5160 Pro and TMC5160T Pro.

Power Supply

Connect the power supply (VM) within the recommended range of 8V to 56V. For optimal safety and performance, it is recommended not to exceed 48V. Ensure the power supply is stable and capable of providing the necessary current for your stepper motors.

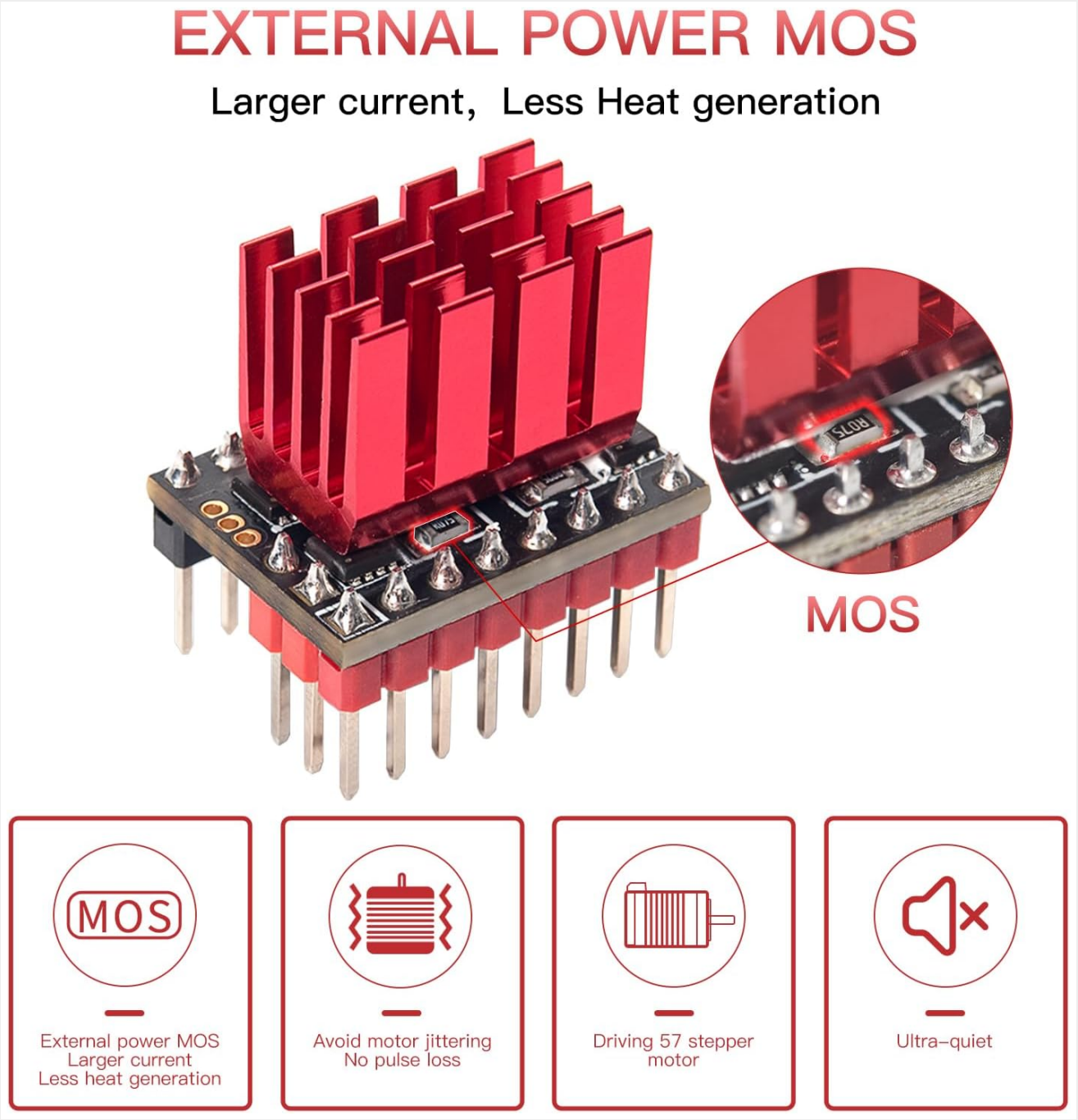

Figure 5: External Power MOS for enhanced current and reduced heat.

Operating Principles

The TMC5160T Pro V1.0 driver leverages advanced TRINAMIC technologies to deliver superior stepper motor control. These technologies contribute to the driver's ultra-quiet operation and ability to prevent pulse loss, leading to more stable and accurate 3D printing.

Ultra-Quiet Operation

With features like StealthChop, the driver significantly reduces motor noise, operating at levels below 10 dB. This makes it ideal for environments where noise reduction is critical.

Figure 6: Ultra-quiet operation of a 57 stepper motor driven by TMC5160T Pro.

Stable Printing and Pulse Loss Prevention

The driver's design prevents motor shaking and minimizes the risk of losing steps, which are common causes of print failures. This ensures consistent and high-quality 3D prints without artifacts caused by pulse loss.

Figure 7: Visual comparison of stable printing versus faults caused by pulse loss.

Maintenance

The BIGTREETECH TMC5160T Pro V1.0 stepper motor driver is designed for durability and reliability. Regular maintenance is minimal but important for ensuring long-term performance.

- **Heat Management:** Ensure the heatsinks are properly installed and free from dust or debris. Adequate airflow around the drivers is essential to dissipate heat effectively, especially during prolonged operation or high current settings.
- **Cleanliness:** Periodically inspect the driver and its connections for any dust accumulation. Use compressed air or a soft brush to gently clean the components. Avoid using liquids or abrasive materials.
- **Connection Integrity:** Verify that all electrical connections to the driver and the mainboard are secure and

free from corrosion. Loose connections can lead to intermittent issues or damage.

Troubleshooting

This section provides guidance on common issues you might encounter with your TMC5160T Pro V1.0 stepper motor driver.

Motor Not Moving or Erratic Movement

- **Check Connections:** Ensure all motor wires and driver pins are correctly and securely connected to the mainboard. Refer to the pinout diagram.
- **Verify Power Supply:** Confirm that the power supply voltage (VM) is within the 8V-56V range and stable. Insufficient current can also cause erratic behavior.
- **Firmware Configuration:** Ensure your 3D printer's firmware is correctly configured for the TMC5160T Pro V1.0 driver, including microstepping settings and operating mode (SPI/SD).
- **Motor Current (Vref):** While the TMC5160T Pro V1.0 is designed for high current, ensure the motor current is set appropriately for your specific stepper motor. Incorrect current can lead to overheating or insufficient torque.

Driver Overheating

- **Heatsink Installation:** Confirm the heatsink is firmly attached to the driver chip with good thermal contact.
- **Adequate Cooling:** Ensure there is sufficient airflow over the drivers. Consider adding a fan if operating in an enclosed space or at higher currents.
- **Motor Current:** Reduce the motor current if it is set too high for your application or motor.

Excessive Motor Noise

- **StealthChop Mode:** Verify that StealthChop mode is enabled in your firmware if quiet operation is desired. Some operating modes prioritize torque over quietness.
- **Motor Quality:** While the driver reduces noise, the inherent quality of the stepper motor can also influence overall noise levels.

Warranty and Support

BIGTREETECH provides a **1-year warranty** for the TMC5160T Pro V1.0 stepper motor driver. This warranty covers manufacturing defects and ensures the product meets its specified performance standards.
For technical support, troubleshooting assistance, or warranty claims, please refer to the official BIGTREETECH support channels. It is recommended to visit the BIGTREETECH website or contact their customer service directly for the most up-to-date support information and resources.

Figure 8: BIGTREETECH TMC5160T Pro V1.0 product packaging.