**🔧 High-Power Load Controller with Temperature Monitoring Using STM32**

This project presents the design and implementation of a **high-power load controller** system, intended for applications requiring reliable switching, protection, and thermal monitoring. The core of the system is built around an **STM32F103C8T6 microcontroller**, ensuring fast and precise control.

**⚙️ Key Features:**

* **Power Path Protection:**
  + Input 40V DC supply is routed through a **fuse** and **TVS diode (P6KE36CA)** for over-voltage and surge protection.
  + A high-current path includes ferrite bead filters and electrolytic capacitors for noise suppression and stability.
* **Temperature Sensing:**
  + **NTC thermistors** are used to monitor system temperature.
  + The sensors are interfaced with STM32 ADC pins to allow real-time temperature data acquisition.
* **Smart Switching:**
  + Based on thermal data, the STM32 controls a **gate driver (UCC27511)** that drives a **high-power N-channel MOSFET (IRF540N)**.
  + This allows dynamic control of the load based on safe operating conditions.
* **Load Control & Safety:**
  + The load is connected through a second MOSFET block with appropriate snubber components and ferrite inductors for EMI control.
  + Fail-safe features are implemented to shut down the load in case of thermal overrun or voltage anomalies.
* **Connector Strategy:**
  + **Ring lugs** are used for high-current paths, and **Molex/Amass/Anderson-type connectors** are considered for modular interfacing.
  + The PCB design considers high-current routing with wide copper traces (~200 mils for 56A paths).

**📐 Design Tools:**

* **Altium Designer** was used for schematic capture and PCB layout.
* Gerber files and BOM were generated for manufacturing readiness.