



# **Analog Temperature Indicator with RGB LED and LM35 Sensor on STM32F446RE**

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# Introduction

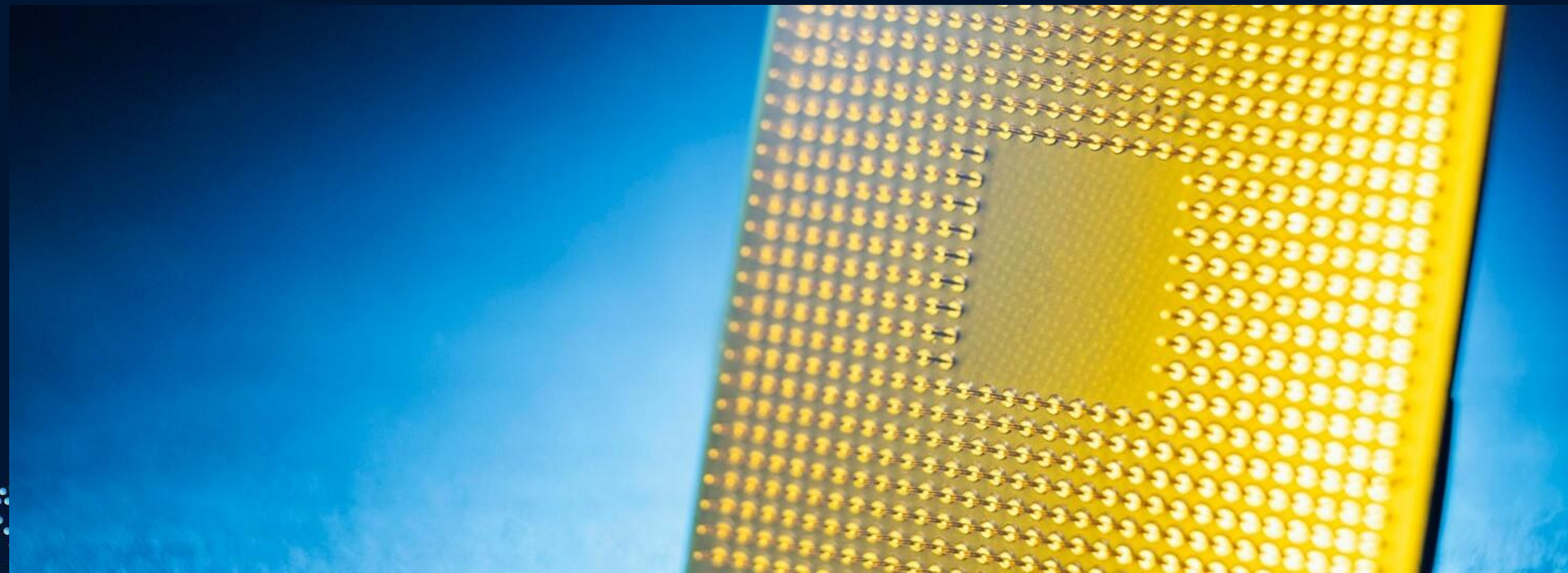
The **Analog Temperature Indicator** project utilizes an *LM35 sensor* and **RGB LED** to display temperature on an *STM32F446RE* microcontroller. This presentation will cover the design, implementation, and applications of this innovative temperature monitoring system.



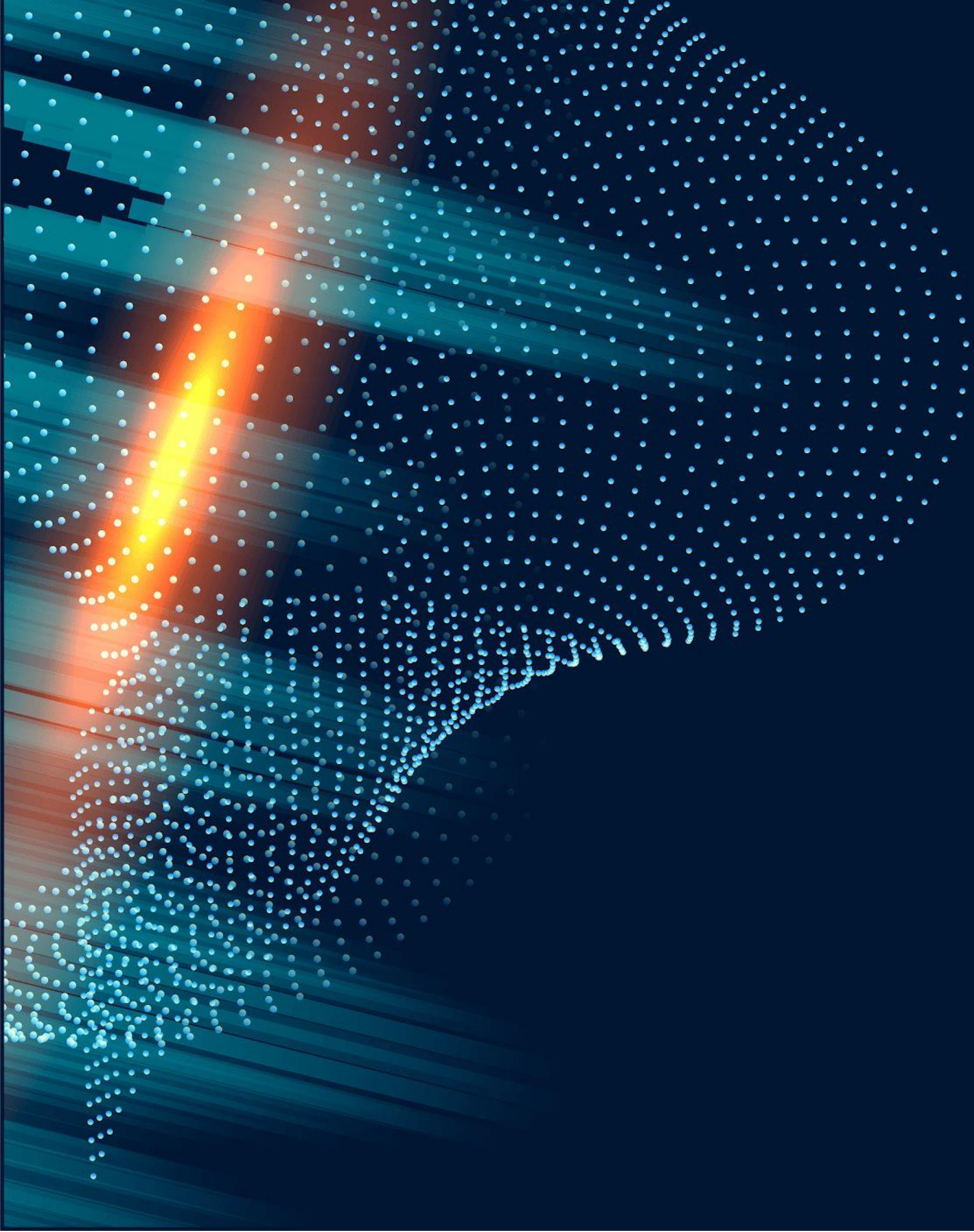


# LM35 Sensor

The *LM35 sensor* is a precision integrated-circuit temperature sensor that provides an **analog voltage output** proportional to the **temperature**. Its **linear output** makes it ideal for interfacing with microcontrollers for temperature measurement.







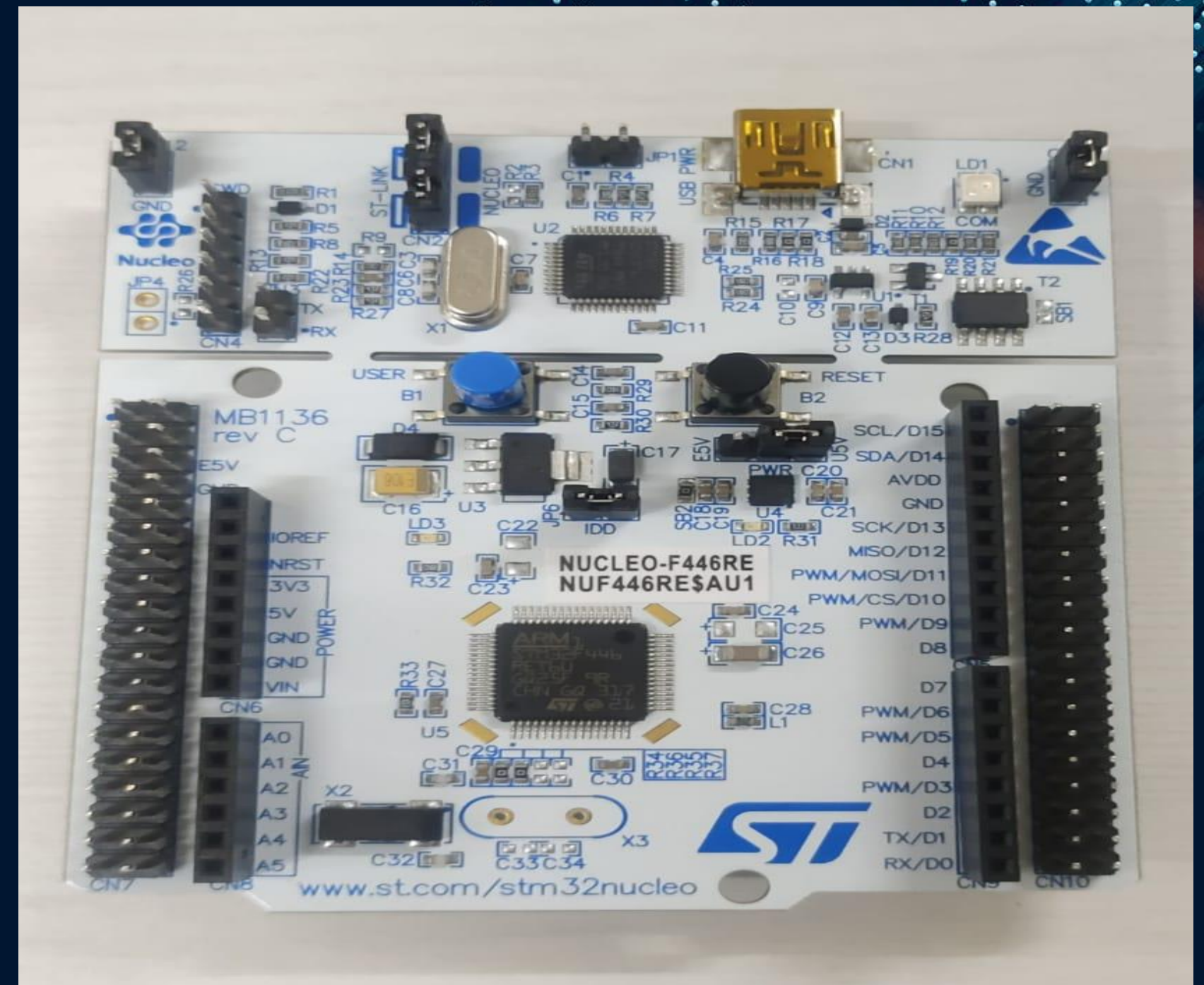
# RGB LED

The **RGB LED** is a **multicolor light-emitting diode** that can produce a wide range of colors by adjusting the intensity of the **red, green, and blue** components. It will be used to visually indicate the temperature range.



# STM32F446RE Microcontroller

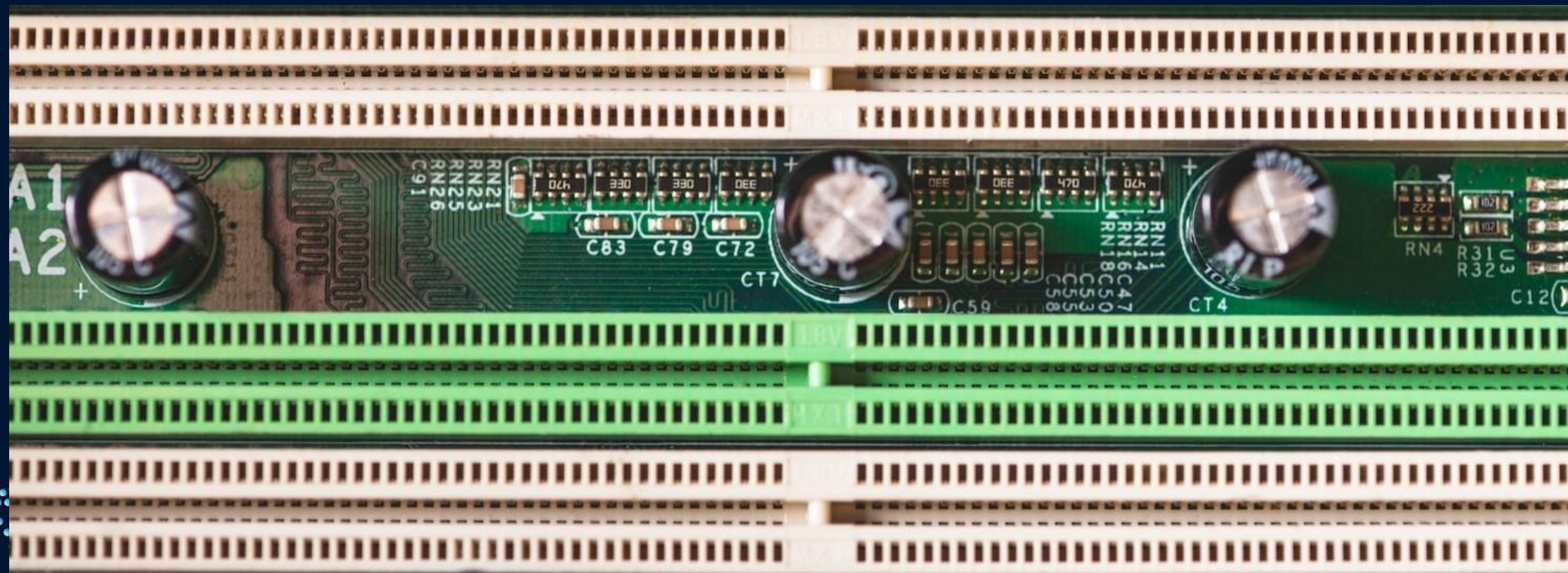
The *STM32F446RE* is a powerful **ARM Cortex-M4** microcontroller with advanced **peripheral features** and a rich set of **hardware development tools**. It will serve as the main processing unit for the temperature indicator system.





# System Design

The system design includes **sensor interfacing, analog-to-digital conversion, LED control, and temperature interpretation**. The **STM32F446RE** will manage these tasks to provide an accurate temperature display.





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# Implementation Steps

The implementation involves **connecting the LM35 sensor** to the microcontroller, **configuring the ADC**, **controlling the RGB LED**, and **coding the temperature interpretation algorithm**. Each step will be detailed in the following slides.







## LM35 Sensor Interfacing

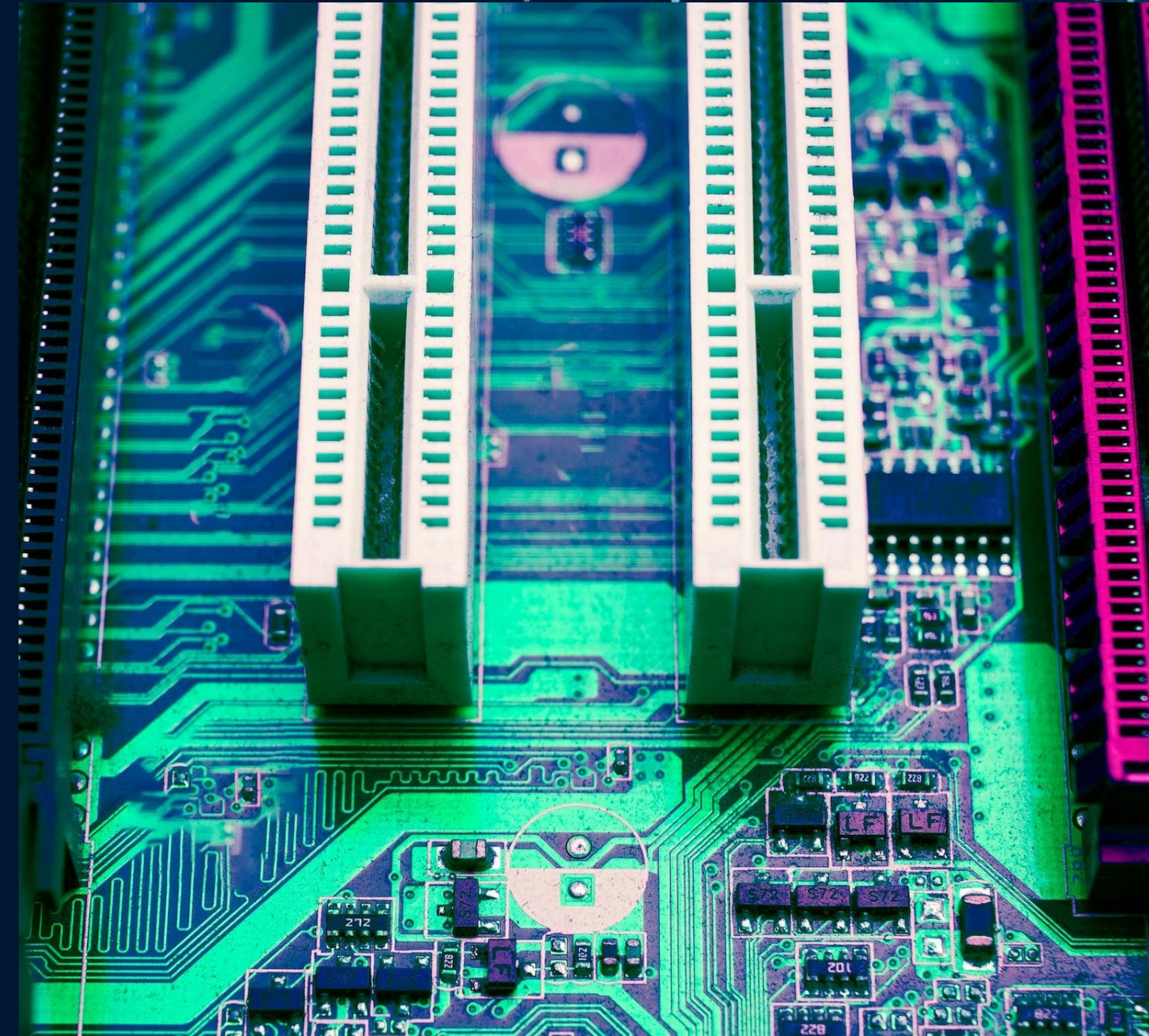
Interfacing the **LM35 sensor** involves **connecting its output pin** to an **analog input** of the microcontroller. The **voltage output** of the sensor will be converted to a **digital value** using the **ADC**.



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# ADC Configuration

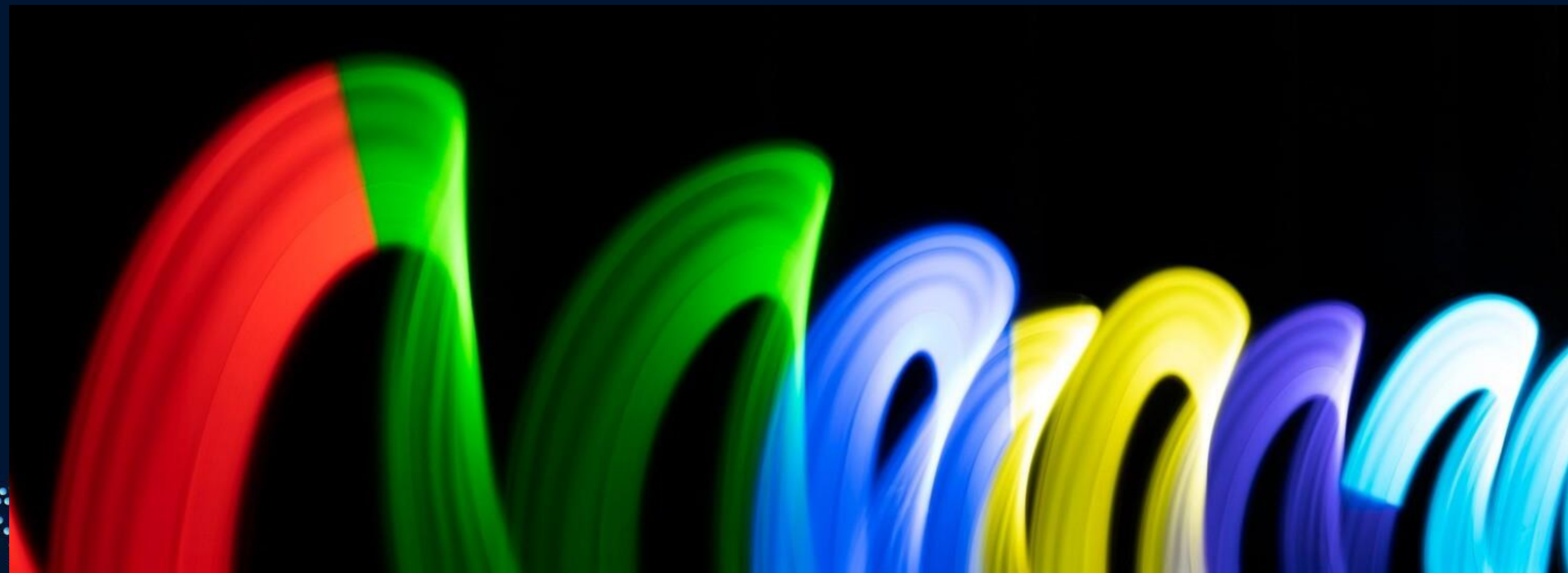
The **Analog-to-Digital Converter (ADC)** of the **STM32F446RE** will be configured to **sample the voltage output** from the LM35 sensor and convert it to a **digital value** representing the temperature. The **resolution** and **sampling rate** will be optimized for accuracy.



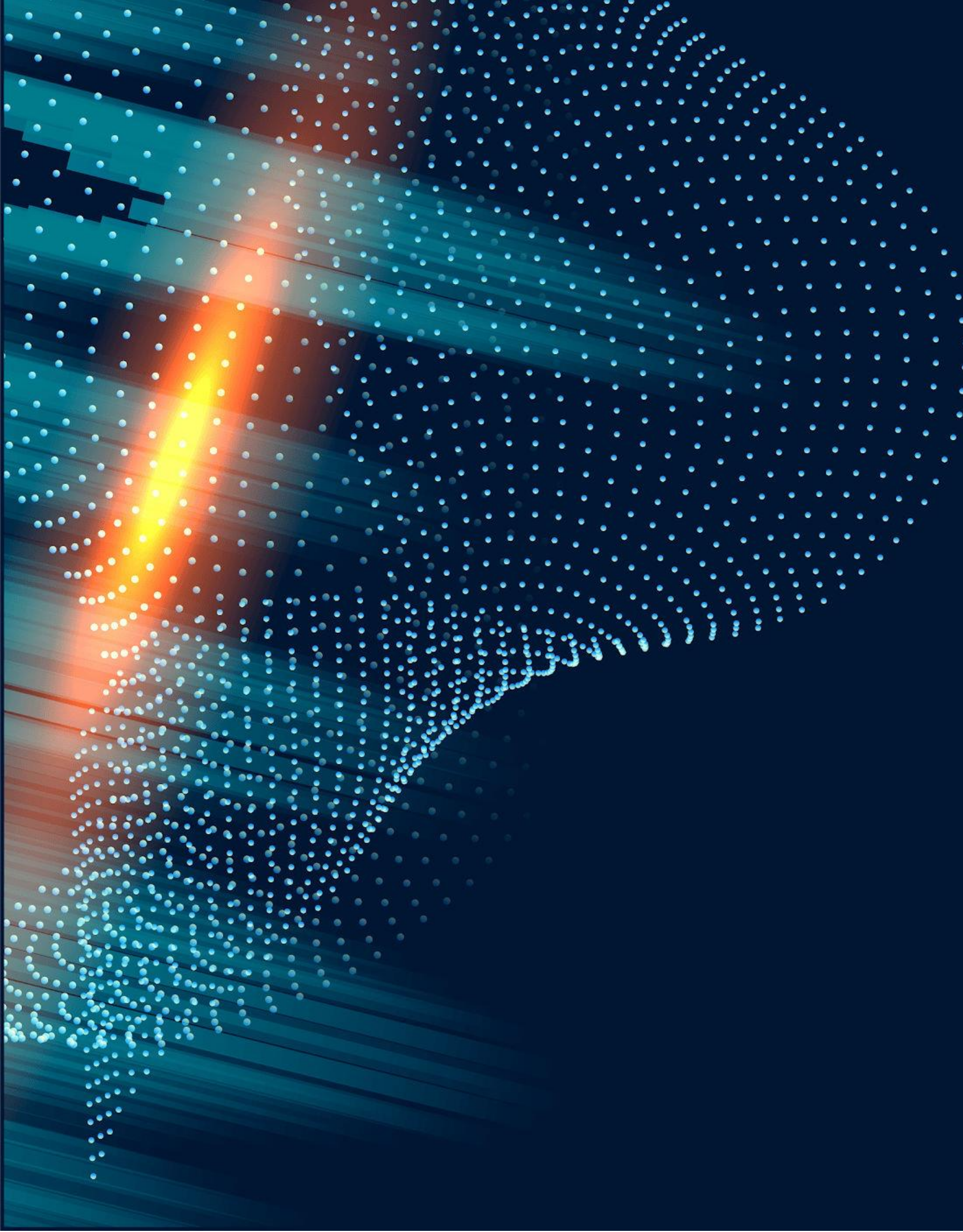


# LED Control

The **RGB LED** will be controlled by the microcontroller to display **different colors** based on the temperature range. The **intensity** of the red, green, and blue components will be adjusted to represent the temperature visually.







## Temperature Interpretation Algorithm

An **algorithm** will be developed to interpret the **digital temperature value** and map it to a **specific color** on the RGB LED. This algorithm will ensure an **intuitive visual representation** of the temperature.





# Applications

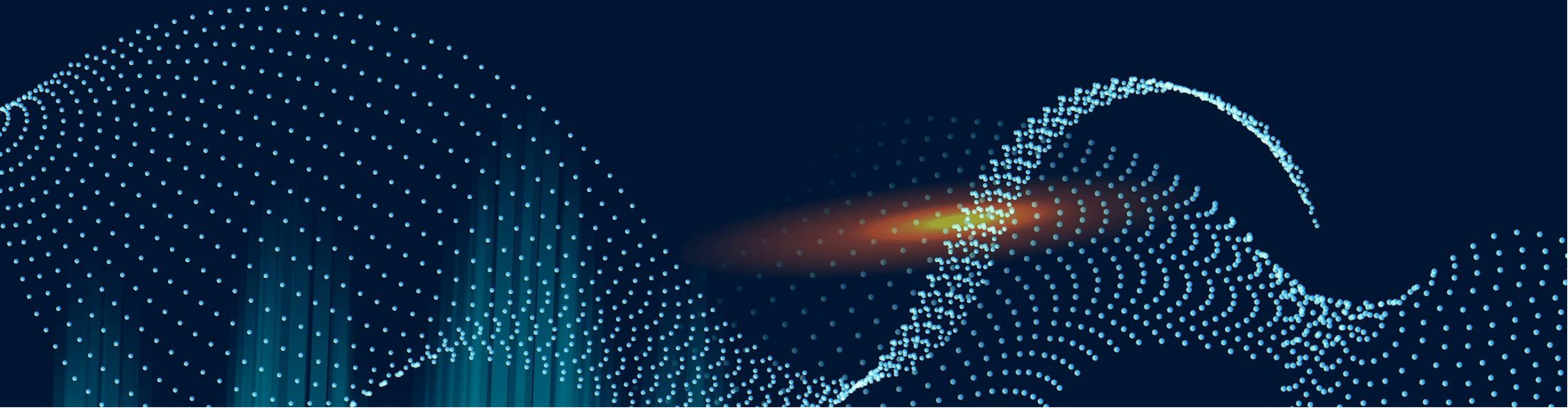
The Analog Temperature Indicator has **various applications** including **environmental monitoring**, **industrial control systems**, and **home automation**. Its **accurate temperature display** and **visual indication** make it versatile for different scenarios.



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# Conclusion

The Analog Temperature Indicator with **LM35 sensor**, **RGB LED**, and **STM32F446RE** microcontroller offers a **reliable and visually intuitive** solution for temperature monitoring. Its **flexible applications** and **precise temperature display** make it a valuable tool in various fields.





# Thanks!



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Do you have any questions?