

## ATtiny85

The **ATtiny series** is a family of **microcontrollers** manufactured by **Atmel** (now part of Microchip Technology). They are compact, low-power microcontrollers that provide a simple yet powerful solution for small embedded systems. ATtiny chips are typically **smaller** and **cheaper** than other microcontrollers like the **Arduino Uno** or **Mega**, making them ideal for space-constrained applications.

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### Key Features:

1. **Size:**
  - ATtiny chips are **small**, often available in **8-pin to 32-pin packages**.
2. **Low Power Consumption:**
  - ATtiny microcontrollers are designed to be **low-power**, suitable for battery-powered devices.
3. **Clock Speed:**
  - Most ATtiny microcontrollers run at a clock speed of **8 MHz to 20 MHz**, depending on the model and configuration.
4. **Flash Memory:**
  - ATtiny chips have **limited flash memory** (from **512 bytes** to **8 KB**), suitable for simple applications.
5. **GPIO Pins:**
  - They have a **small number of I/O pins**, often ranging from **6 to 14**. These pins can be configured for **digital input/output**, **analog input**, and some models support **PWM** output, **I2C**, or **SPI** communication.
6. **Analog-to-Digital Converter (ADC):**
  - ATtiny microcontrollers include **ADC** channels, allowing you to read analog sensors.
7. **Affordable & Compact:**

- These microcontrollers are **cost-effective** and ideal for applications with space and power constraints.
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## Popular ATtiny Models:

### 1. ATtiny85:

- **8 pins, 8 KB flash memory, 512 bytes SRAM, ADC channels.**
- Popular in small projects like sensors or simple devices. Can be programmed via **Arduino IDE** using a USB-to-Serial adapter.

### 2. ATtiny13:

- **6 pins, 1 KB flash memory, 64 bytes SRAM.**
- Best for very simple applications with minimal I/O.

### 3. ATtiny45:

- **8 pins, 4 KB flash memory, 256 bytes SRAM.**
- More memory than ATtiny13, but still compact.

### 4. ATtiny84:

- **14 pins, 8 KB flash memory, 512 bytes SRAM.**
  - More pins and memory for medium-complexity applications.
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## Programming ATtiny:

### ● Via Arduino IDE:

- ATtiny85 can be programmed using the **Arduino IDE** with a USB-to-Serial adapter and the **ATtiny core** installed.

### ● Using the Arduino as ISP:

- For programming the ATtiny, an **Arduino board** (like Arduino Uno) can be used as an ISP programmer to burn the bootloader and upload code.

- **Tools Required:**
    - **USB-to-Serial adapter** (for ATtiny85) or use **Arduino as ISP**.
    - **Arduino IDE** or other compatible IDEs.
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## Use Cases:

- **Wearable electronics**
  - **Sensor-based systems**
  - **Simple controllers**
  - **IoT devices**
  - **Low-power, space-constrained applications**
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## Advantages of ATtiny:

- **Compact and lightweight** design for small gadgets.
  - **Low cost**, making it ideal for budget projects.
  - Low power consumption, ideal for **battery-operated devices**.
  - **Easy to program** with Arduino IDE or external programmers.
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## Limitations:

- **Limited I/O pins** and peripherals compared to larger microcontrollers.
  - **Limited flash memory** and **RAM**.
  - Some ATtiny models may require **external programmers** to upload code (e.g., USBasp or Arduino as ISP).
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