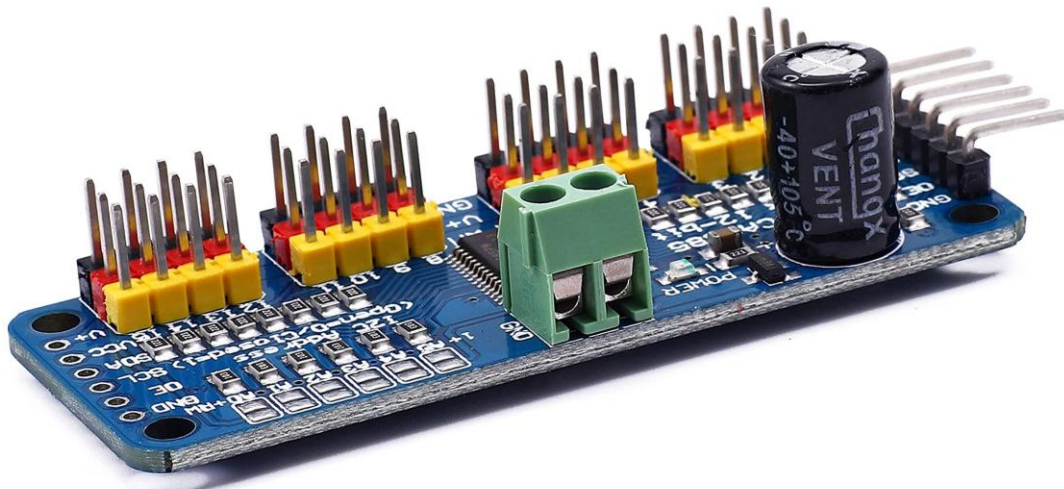


## PCA9685 16-Channel 12-bit PWM Servo Motor Driver I2C Module for Arduino



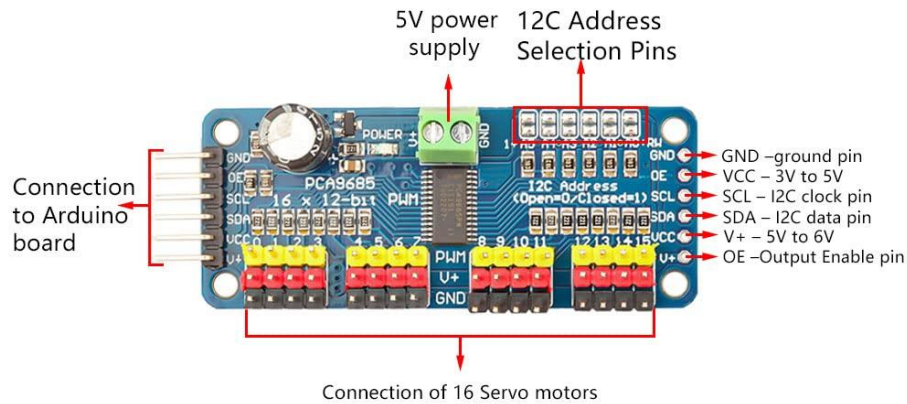
The **PCA9685 16-Channel 12-bit PWM Servo Motor Driver I2C Module** is an advanced and versatile solution for controlling multiple servos, LEDs, or other PWM-based devices with ease. Powered by the reliable PCA9685 chip, this module is an essential component for hobbyists, students, and professionals who are developing projects involving robotics, automation, drones, or any system that requires precise control of motors and LEDs.

Unlike traditional motor controllers, the PCA9685 allows you to **drive up to 16 channels independently**, with each output providing a high-resolution 12-bit PWM signal. This translates

to **4,096 different duty cycles per channel**, ensuring smooth, accurate, and flexible control over your connected devices.

## ◆ Key Features

- **16-Channel PWM Outputs**  
Control up to 16 servos, motors, or LEDs simultaneously from just one module. Multiple modules can be connected together for even larger projects.
- **High-Resolution 12-bit Control**  
Provides 4,096 distinct steps per output, offering precise and stable movement for servos and smooth dimming for LEDs.
- **I2C Interface**  
Communicates easily with Arduino, Raspberry Pi, ESP32, and other microcontrollers using the standard I2C protocol. This reduces the number of required pins and simplifies wiring.
- **Adjustable Frequency**  
Supports a PWM frequency range of 24Hz to 1.6kHz, making it suitable for different types of servos and applications.
- **Onboard Power Supply Options**  
Equipped with a 5V regulator and terminal block input, allowing external power sources to drive high-current servos without overloading your microcontroller.
- **Stackable Design**  
Thanks to configurable address pins, you can daisy-chain multiple PCA9685 boards together, supporting up to **62 modules** on a single I2C bus—controlling nearly **992 servos** in total!
- **Compact & Durable PCB Design**  
Designed with high-quality PCB material, onboard filter capacitors, and solid connectors for reliable long-term use.



## Technical Specifications

- **Chipset:** PCA9685
- **PWM Resolution:** 12-bit (4096 steps)
- **Number of Channels:** 16
- **Communication:** I2C (address configurable via jumpers)
- **Operating Voltage:** 3.3V – 5V (logic level compatible)
- **PWM Frequency Range:** 24Hz – 1.6kHz
- **Output Drive:** Up to 25mA per channel (suitable for direct LED drive, servo signals, etc.)
- **Input Power Supply:** 5V DC via terminal block or VCC pin
- **Dimensions:** Approx. 62mm x 26mm

## Applications

The PCA9685 PWM driver is widely used in many **DIY electronics and professional projects**, including:

- **Robotics** 🤖 – Control robotic arms, humanoid robots, and legged robots with multiple servos.
  - **Drones & RC Vehicles** 🚁 – Manage multiple motors and servos in quadcopters, planes, and cars.
  - **Smart Lighting** 💡 – Drive multiple LED strips or lighting effects with precision dimming control.
  - **3D Printing & CNC Machines** 🖨️ – Handle additional servos and actuators for advanced motion control.
  - **Home Automation** 🏠 – Control blinds, doors, and appliances with servo-based mechanisms.
  - **Educational Projects** 🎓 – Perfect for students learning about PWM control, robotics, and electronics.
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## ✓ Why Choose PCA9685 Servo Driver?

1. **Ease of Use** – The module integrates seamlessly with Arduino and Raspberry Pi using readily available libraries. Beginners can get started in minutes.
2. **Scalability** – From small projects with just a few servos to large robotic systems with hundreds of motors, the PCA9685 can expand effortlessly.
3. **Precision** – With 12-bit resolution, you get smoother control compared to traditional 8-bit PWM, which is critical for robotics and motion systems.
4. **Reliability** – Built-in oscillator ensures stable performance without relying on the microcontroller's timing.
5. **Cost-Effective** – Delivers professional-grade control at an affordable price, making it popular among hobbyists and engineers alike.

