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Adafruit TCA9548A

Adafruit TCA9548A I2C Multiplexer User Manual

Model: TCA9548A | Brand: Adafruit

INTRODUCTION

The Adafruit TCA9548A I2C Multiplexer is a device designed to expand the capabilities of your microcontroller by allowing multiple I2C devices with the same address to operate on a single I2C bus. This manual provides essential information for its proper setup and operation, enabling you to integrate several identical I2C sensors or modules into your projects without address conflicts.

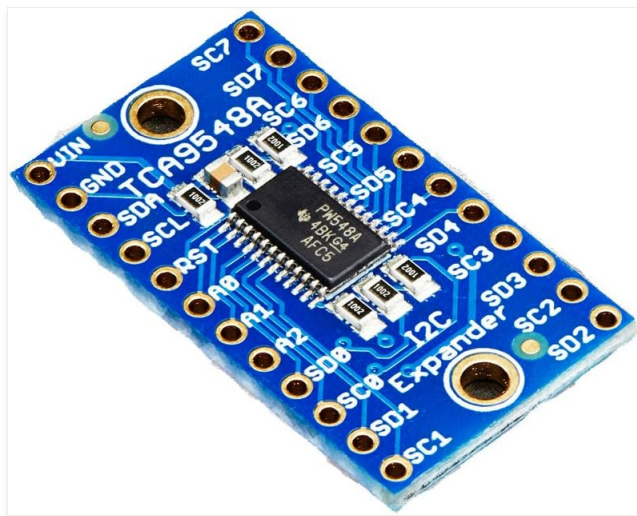


Image: The Adafruit TCA9548A I2C Multiplexer breakout board, showcasing its compact design and pin layout.

KEY FEATURES

- Allows connection of up to 8 I2C devices with identical addresses to one microcontroller.
- Acts as a gatekeeper, routing I2C commands to selected ports.
- Adjustable I2C address for the multiplexer itself (0x70 to 0x77).
- 3V and 5V compliant logic levels, ensuring compatibility with various microcontrollers.
- Breakout board design for breadboard compatibility, including capacitors and pull-ups/pull-downs for ease of use.

TECHNICAL SPECIFICATIONS

Feature	Detail
Model	TCA9548A
Brand	Adafruit
I2C Addresses	Multiplexer: 0x70-0x77 (configurable)
Logic Voltage	3V and 5V compliant
Item Weight	0.32 ounces
Item Model Number	8541585622
First Available	September 17, 2015

SETUP GUIDE

Hardware Setup

This section details the physical connection of the Adafruit TCA9548A I2C Multiplexer to your microcontroller and I2C devices.

Components Required

- Adafruit TCA9548A I2C Multiplexer
- Microcontroller (e.g., Arduino, Raspberry Pi)
- I2C devices (sensors, displays, etc.)
- Breadboard (optional, for prototyping)
- Header pins (for soldering to the breakout board)
- Jumper wires

Connection Steps

1. **Solder Header Pins:** Solder the provided header pins to the TCA9548A breakout board. This allows it to be easily inserted into a breadboard or connected via jumper wires.

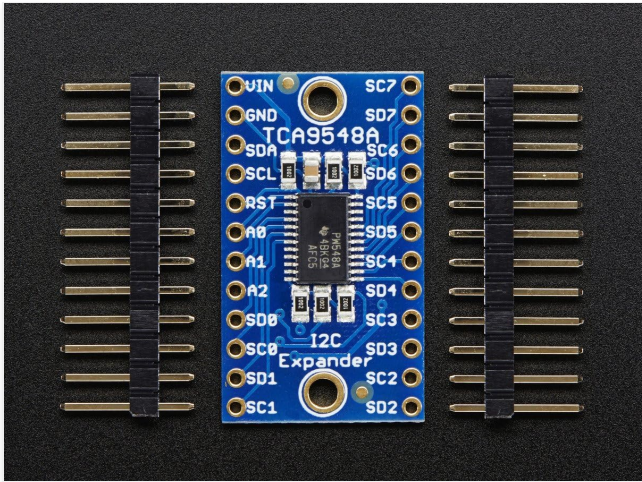


Image: The Adafruit TCA9548A I2C Multiplexer board with male header pins soldered on both sides, ready for breadboard insertion. The main chip and various pins like VIN, GND, SDA, SCL, RST, A0-A2, and SC0-SC7 are

visible.

2. **Power Connection:** Connect the VIN pin of the multiplexer to the 3V or 5V power supply of your microcontroller. Connect the GND pin of the multiplexer to the ground of your microcontroller. The TCA9548A is 3V and 5V compliant.
3. **I2C Bus Connection (Microcontroller to Multiplexer):** Connect the SDA pin of your microcontroller to the SDA pin on the multiplexer. Connect the SCL pin of your microcontroller to the SCL pin on the multiplexer.
4. **I2C Device Connection (Multiplexer to Devices):** Connect your I2C devices to the multiplexed I2C ports (SC0/SD0, SC1/SD1, ..., SC7/SD7). Each pair (SCx/SDx) represents an independent I2C bus.

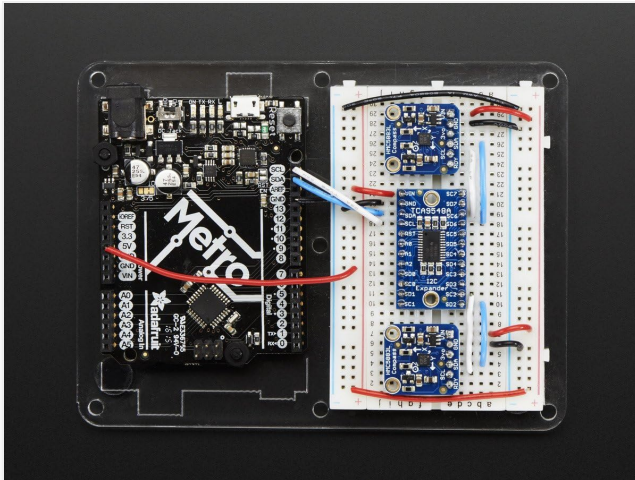


Image: An Adafruit TCA9548A I2C Multiplexer connected to an Adafruit Metro microcontroller and two I2C compass modules on a breadboard. Wires connect the main I2C bus from the Metro to the multiplexer, and then from two of the multiplexer's output channels to the individual compass modules.

5. **Address Configuration (Optional):** The default I2C address for the multiplexer is 0x70. You can change this by connecting the A0, A1, and A2 pins to VCC or GND. For example, connecting A0 to VCC would change the address to 0x71. Refer to the TCA9548A datasheet for specific address configurations.

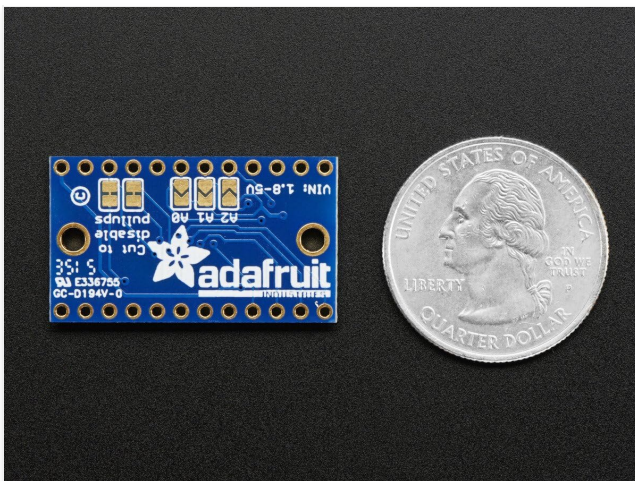


Image: The reverse side of the Adafruit TCA9548A I2C Multiplexer board, showing the Adafruit logo, VIN, and the A0-A2 address configuration pins. A US quarter coin is placed next to the board for size comparison.

Software Setup

To communicate with the TCA9548A and connected I2C devices, you will need to use appropriate software libraries for your microcontroller.

Arduino Example (Conceptual)

1. **Install Library:** Install the Adafruit TCA9548A library (or a compatible I2C multiplexer library) through your Arduino IDE's Library Manager.
2. **Initialize Multiplexer:** In your code, initialize the multiplexer with its I2C address (default 0x70).
3. **Select Channel:** Before communicating with an I2C device, select the corresponding channel on the multiplexer. For example, to talk to a device on SC0/SD0, you would write a byte to the multiplexer's address indicating channel 0.
4. **Communicate with Device:** Once the channel is selected, all subsequent I2C packets will be sent to that port until a new channel is selected.

OPERATING INSTRUCTIONS

Basic Operation

The TCA9548A operates by allowing you to programmatically select which of its 8 downstream I2C buses is active. Only one channel can be active at a time.

Channel Selection

To select a channel (0-7), write a single byte to the multiplexer's I2C address. The byte's value corresponds to the channel you wish to activate. For example, writing 0x01 selects channel 0, 0x02 selects channel 1, 0x04 selects channel 2, and so on (using bitmasks for channel selection). Consult the TCA9548A datasheet or Adafruit's tutorials for specific code examples.

Communication Flow

1. Your microcontroller sends an I2C command to the TCA9548A's address to select a specific output channel.
2. The TCA9548A then connects its main I2C bus (from the microcontroller) to the selected output channel.
3. Your microcontroller then sends I2C commands to the address of the target device. These commands are routed through the selected channel.
4. To communicate with a device on a different channel, repeat step 1 to select the new channel.

MAINTENANCE

Care and Handling

- Keep the board clean and free from dust and moisture.
- Avoid applying excessive force to the pins or components.
- Store in an anti-static bag when not in use to prevent electrostatic discharge (ESD) damage.
- Ensure proper ventilation if enclosed in a case to prevent overheating.

TROUBLESHOOTING

Common Issues and Solutions

- **Issue: I2C devices not detected.**
 - **Solution:** Verify all power (VIN) and ground (GND) connections.
 - **Solution:** Check SDA/SCL connections from microcontroller to multiplexer, and from

multiplexer to devices.

- **Solution:** Ensure the multiplexer's I2C address is correctly set and used in your code.
 - **Solution:** Confirm the correct channel is selected on the multiplexer before attempting to communicate with a device.
 - **Solution:** Check for short circuits or cold solder joints on header pins.
 - **Solution:** Ensure pull-up resistors are correctly configured (the breakout board includes them, but external ones might be needed depending on the setup and bus length).
- **Issue: Only one device works, others don't.**
 - **Solution:** This indicates a channel selection issue. Ensure you are explicitly selecting the correct channel for each device before attempting to communicate with it. Remember, only one channel is active at a time.
- **Issue: Board not recognized by microcontroller.**
 - **Solution:** Double-check the main I2C connections (SDA, SCL, VIN, GND) between the microcontroller and the TCA9548A. Confirm the microcontroller's I2C bus is enabled and functioning.
- **Issue: Inconsistent readings or communication errors.**
 - **Solution:** Check for loose connections.
 - **Solution:** Ensure power supply is stable and sufficient for all connected devices.
 - **Solution:** Verify I2C clock speed compatibility between devices and microcontroller.
 - **Solution:** Consider adding external pull-up resistors if the bus length is long or many devices are connected, though the board has internal ones.

WARRANTY AND SUPPORT

Product Support

For technical assistance, detailed documentation, and community forums, please visit the official Adafruit website. Adafruit provides extensive tutorials and resources for their products, which can be invaluable for advanced usage and project integration.

This product is typically covered by a standard manufacturer's warranty against defects in materials and workmanship. Please refer to Adafruit's official warranty policy on their website for detailed terms and conditions regarding returns, repairs, and replacements.