GODIYMODULES TCA9548A

GODIYMODULES TCA9548A 1-to-8 I2C Multiplexer Expansion Board User Manual

Model: TCA9548A

1. Introduction

The GODIYMODULES TCA9548A is a versatile 1-to-8 I2C 8-way multi-channel expansion board designed to simplify I2C communication in embedded systems. This multiplexer allows a single I2C master to communicate with up to eight different I2C buses, each potentially hosting multiple devices, even if those devices share the same I2C address. It features eight bi-directional transfer switches controlled via the I2C bus, making it ideal for projects requiring numerous I2C sensors or peripherals.
This module operates within a voltage range of DC 3.3V to 5V, making it compatible with a wide array of development platforms such as Arduino, ESP32, ESP8266, Raspberry Pi, and STM32.

2. Product Features

- **8-Channel I2C Expansion:** Provides eight independent I2C channels from a single I2C master port.
- **Bi-directional Switches:** Each channel features a bi-directional transfer switch for seamless data flow.
- **Configurable I2C Address:** The TCA9548A itself has a configurable I2C address, settable from 0x70 to 0x77 using pins A0, A1, and A2.
- **Address Conflict Resolution:** Enables connection of multiple I2C devices with identical addresses on the same I2C port by isolating them onto different multiplexer channels.
- **Cascading Capability:** Theoretically, up to 8 TCA9548A expanders can be cascaded (each with a unique address from 0x70-0x77), allowing for control of up to 64 devices with the same address on a single I2C bus.
- **Wide Operating Voltage:** Supports a working voltage of DC 3.3V-5V.

3. Setup Instructions

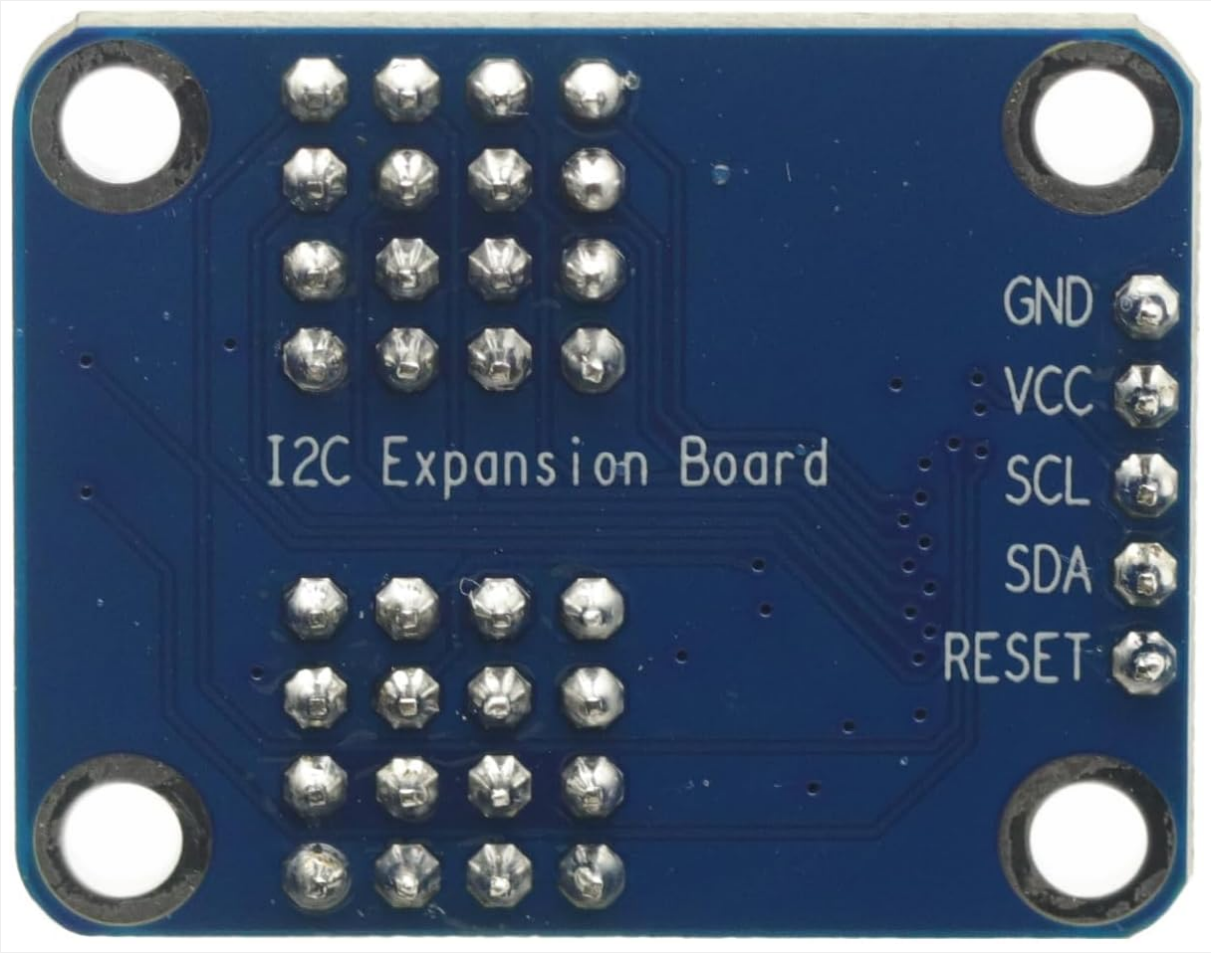
3.1 Physical Connection

Connect the TCA9548A module to your microcontroller (e.g., Arduino, ESP32, Raspberry Pi) using the following pins:

- **VCC:** Connect to your microcontroller's 3.3V or 5V power supply.

- **GND:** Connect to your microcontroller's ground.
- **SCL:** Connect to your microcontroller's I2C clock line.
- **SDA:** Connect to your microcontroller's I2C data line.

Each of the eight output channels (SCL0/SDA0 through SCL7/SDA7) can then be connected to your I2C slave devices.



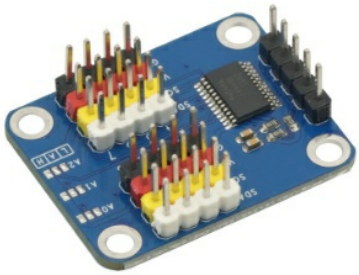
Top view of the TCA9548A I2C Multiplexer board, highlighting the pin headers for power, I2C communication, and the eight selectable I2C channels.

3.2 I2C Address Configuration

The TCA9548A module itself is an I2C device and requires its own unique address on the main I2C bus. This address is configured using the A0, A1, and A2 pins on the board. By setting these pins to a logic LOW ('L') or logic HIGH ('H') state, you can select one of eight possible I2C addresses, ranging from 0x70 to 0x77.
Typically, these pins are connected to GND for a LOW state or VCC for a HIGH state. Refer to the table below for specific address assignments:

I2C address problem

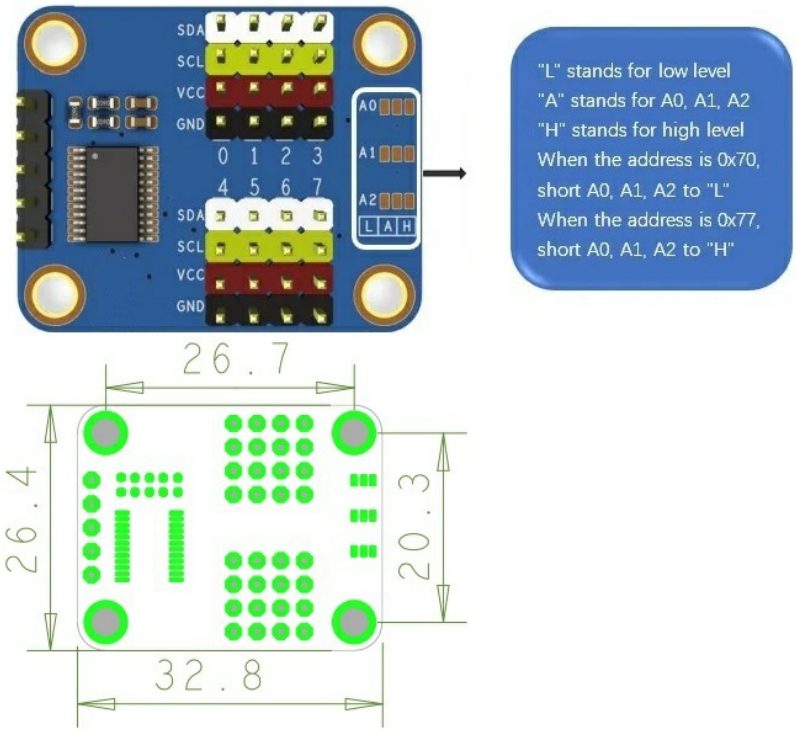
TCA9548 is also an I2C device, itself has an I2C address. tCA9548 own address and A0, A1, A2 port level state related, can be combined out of 8 I2C address. When the address is 0x70, A0, A1 and A2 are connected low, and when the maximum address is 0x77, A0, A1 and A2 are connected high.



I2C address assignment

INPUTS			I^2C BUS SLAVE ADDRESS
A2	A1	A0	
L	L	L	112 (decimal), 70 (hexadecimal)
L	L	H	113 (decimal), 71 (hexadecimal)
L	H	L	114 (decimal), 72 (hexadecimal)
L	H	H	115 (decimal), 73 (hexadecimal)
H	L	L	116 (decimal), 74 (hexadecimal)
H	L	H	117 (decimal), 75 (hexadecimal)
H	H	L	118 (decimal), 76 (hexadecimal)
H	H	H	119 (decimal), 77 (hexadecimal)

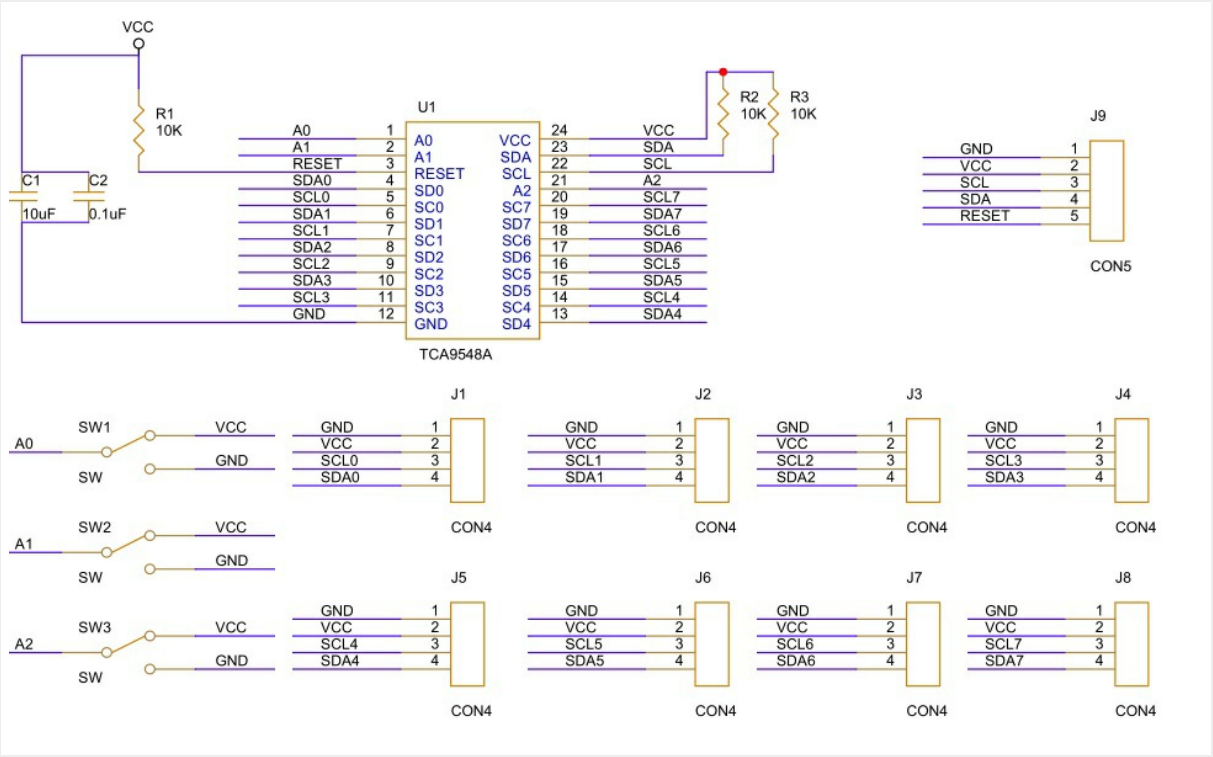
This image displays the TCA9548A module alongside a table detailing how to configure the I2C slave address. The address is determined by the state of pins A0, A1, and A2 (Low 'L' or High 'H'), allowing for addresses from 0x70 to 0x77.



A top-down view of the TCA9548A board, illustrating its physical dimensions and providing a legend for the 'L' (low level) and 'H' (high level) states of the A0, A1, A2 address pins, which are used to set the I2C address.

3.3 Schematic Diagram

For advanced users or troubleshooting, the schematic diagram provides a detailed view of the internal connections and components of the TCA9548A module.



Detailed circuit schematic for the TCA9548A I2C Multiplexer, showing connections for VCC, GND, SCL, SDA, RESET, and the eight multiplexed I2C channels (SCL0-SDA0 to SCL7-SDA7). It also illustrates the address selection pins A0, A1, A2.

4. Operating Instructions

To operate the TCA9548A, your microcontroller first communicates with the multiplexer itself using its configured I2C address (e.g., 0x70). You then send a command to the TCA9548A to select which of its eight downstream I2C channels (0-7) you wish to activate. Once a channel is selected, all subsequent I2C communications from your microcontroller will be routed through that specific channel to the connected I2C slave devices.
This allows you to effectively switch between different I2C buses. For example, if you have two identical sensors, each with the same I2C address, you can connect one to channel 0 and the other to channel 1. By selecting channel 0, you communicate with the first sensor; by selecting channel 1, you communicate with the second, resolving address conflicts.
Most microcontroller development environments (like Arduino IDE, MicroPython for ESP32/ESP8266) have libraries available that simplify interaction with the TCA9548A, abstracting the channel selection process.

5. Maintenance

The TCA9548A is a robust electronic component designed for long-term use. To ensure optimal performance and longevity:

- **Handle with Care:** Avoid dropping or subjecting the board to excessive physical stress.
- **Keep Dry:** Protect the module from moisture and liquids, which can cause short circuits and damage.
- **Cleanliness:** Keep the board free from dust and debris. Use a soft, dry brush or compressed air for cleaning if necessary.
- **Proper Power Supply:** Always ensure the input voltage is within the specified DC 3.3V-5V range. Over-voltage can permanently damage the module.
- **Static Discharge:** Take precautions against electrostatic discharge (ESD) when handling the board, as static electricity can damage sensitive electronic components.

6. Troubleshooting

If you encounter issues with your TCA9548A module, consider the following troubleshooting steps:

- **No I2C Communication:**
  - Verify all power (VCC, GND) and I2C (SCL, SDA) connections are secure and correct.
  - Double-check the I2C address of the TCA9548A module itself. Ensure the A0, A1, A2 pins are set correctly according to the address assignment table (Section 3.2).
  - Confirm that your microcontroller's I2C bus is initialized and functioning correctly.
- **Device Not Responding on a Channel:**
  - Ensure you have correctly selected the desired channel on the TCA9548A before attempting to communicate with the slave device.
  - Verify the connections between the TCA9548A output channel and the slave device.
  - Check the power supply to the slave device.
  - Confirm the I2C address of the slave device is correct and that it is functioning independently.
- **Intermittent Communication:**
  - Check for loose connections or poor soldering.
  - Ensure adequate power supply stability.
  - Consider adding pull-up resistors to the I2C lines if they are missing or insufficient, especially for longer wire runs.

7. Specifications

Feature	Description
Model Name	TCA9548A
Brand	GODIYMODULES
Work Voltage	DC 3.3V-5V
Number of Channels	8 (1-to-8 I2C)
I2C Address Range	0x70 to 0x77 (Configurable via A0, A1, A2 pins)
Connectivity Technology	I2C
Compatible Devices	Arduino, ESP32, ESP8266, Raspberry Pi, STM32
Item Weight	0.317 ounces (approx. 9 grams)
Package Dimensions	5.59 x 4.06 x 1.22 inches

8. Package Contents

The package includes:

- 1x TCA9548A 1-to-8 I2C Multiplexer Expansion Board

9. Warranty and Support

For any technical assistance, questions, or concerns regarding the TCA9548A module, please contact GODIYMODULES customer support through the retailer's platform or the manufacturer's official website. Please

have your purchase details and model number ready for efficient service.