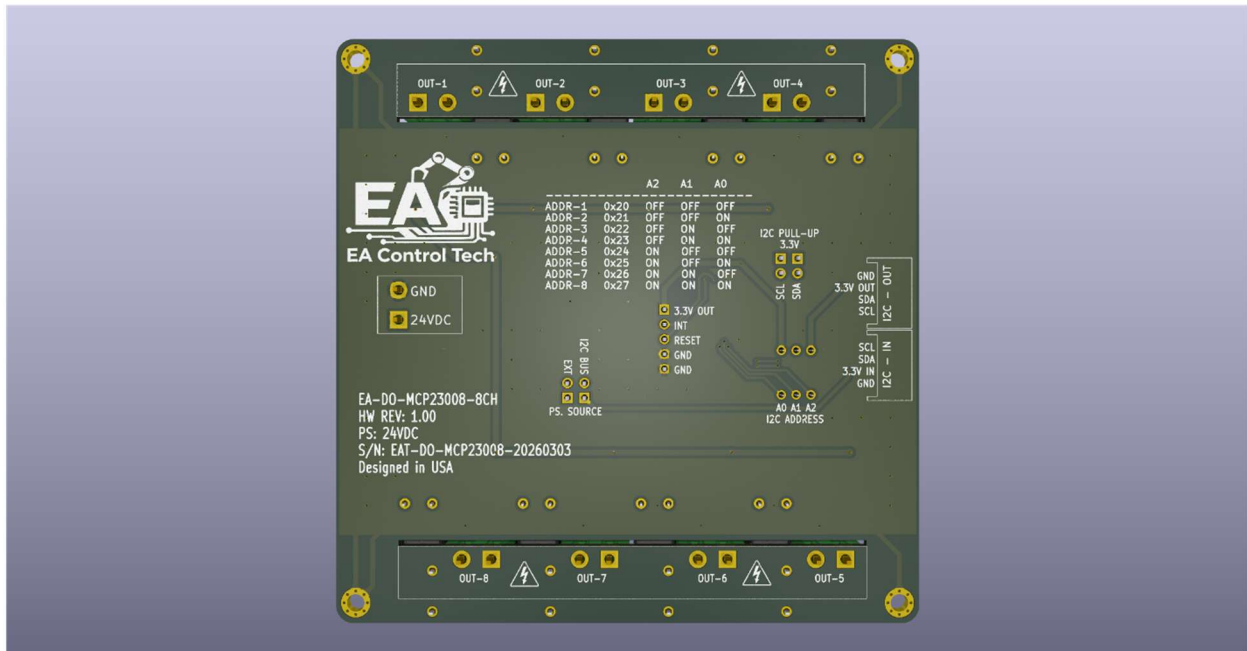
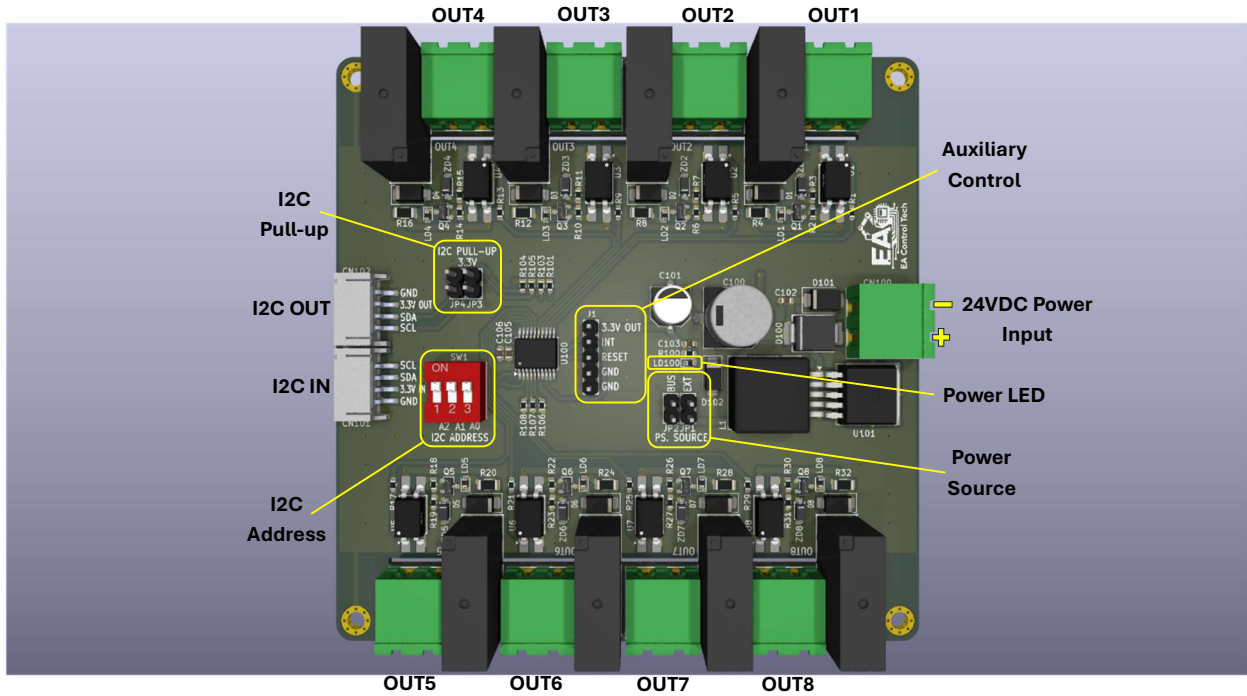




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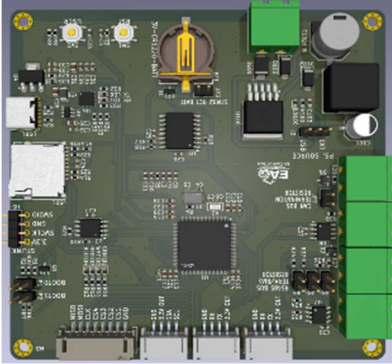
8-Channel 24VDC Relay Output Module with Optocoupler Drivers

Model: EA-DO-MCP23008-8CH
Hardware Revision: V1.0

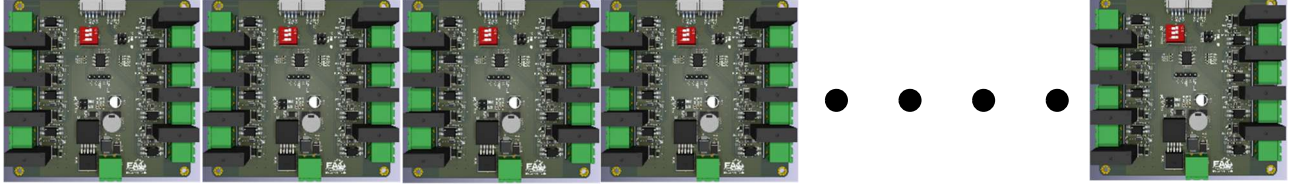


EA Control Tech 8-Channel 24VDC Relay Output Module with Optocoupler Drivers

EA-CORE-407



I2C BUS



EA-DI-MCP23017-16CH
I2c Address = 0x20

EA-DI-MCP23017-16CH
I2c Address = 0x21

EA-DI-MCP23017-16CH
I2c Address = 0x22

EA-DI-MCP23017-16CH
I2c Address = 0x23

EA-DI-MCP23017-16CH
I2c Address = 0x27



EA Control Tech
8-Channel 24VDC Relay Output Module
with Optocoupler Drivers

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EA Control Tech 8-Channel 24VDC Relay Output Module with Optocoupler Drivers

Product Overview

The EA-DO-MCP23008-8CH is an 8-channel relay outputs module designed for industrial 24VDC control systems.

The module is based on the MCP23008 I²C GPIO expander and allows a host controller to control external loads through eight relay outputs.

Each output channel includes:

- optocoupler-driven control circuitry
- transistor driver stage
- relay output contact
- output status indicator
- flyback protection for the relay coil

The module communicates with the host system through an I²C interface and is suitable for applications requiring reliable switching of AC or DC loads such as relays, solenoids, lamps, or other control devices.

Intended Applications

Typical applications include:

- PLC and embedded controller output expansion
- Industrial automation control systems
- Relay and contactor control
- Alarm and signaling systems
- Remote I/O systems
- Distributed equipment control

Key Features

- 8 × relay outputs (SPST normally open)
- MCP23008 I²C GPIO expander
- 3.3V logic interface
- Optocoupler-driven relay control for improved signal integrity
- Flyback protection for relay coils
- Output status LEDs
- I²C address selection via DIP switch (A0, A1, A2)
- Interrupt output available (INT)
- Hardware reset pin available
- I²C IN and I²C OUT connectors for bus expansion



EA Control Tech 8-Channel 24VDC Relay Output Module with Optocoupler Drivers

- On-board 24V → 3.3V buck regulator
- Optional external 3.3V supply
- Industrial screw terminal connectors
- PCB size: 100 mm × 100 mm

System Architecture

The module consists of three main functional blocks:

- I²C Communication Interface
- Relay Driver Circuitry
- Relay Output Contacts

The MCP23008 GPIO expander receives commands from the host controller via the I²C bus and controls the relay driver circuitry through optocouplers.

The relay drivers energize the relay coils, which in turn switch the external load connected to the output terminals.

Electrical Characteristics (Preliminary – HW Rev 1.0)

Power Supply

Parameter	Value
Nominal Supply	24 VDC
Supply Type	External DC
Protection	Reverse polarity diode, TVS suppression
On-board regulation	Buck regulators (3.3 V & analog rail)

3.3V Source Selection: The board supports selecting either:

- On-board generated 3.3V, or
- External 3.3V input (3.3V-Ext)

Logic Interface

Parameter	Value
Communication	I ² C
Logic Level	3.3V
Device	MCP23008
Interrupts	INTA, INTB exposed
Reset	RESET exposed



EA Control Tech 8-Channel 24VDC Relay Output Module with Optocoupler Drivers

Relay Outputs

Parameter	Value
Number of Outputs	8
Relay Type	SPST Normally Open
Contact Rating	5 A
Maximum Load Voltage	30 VDC / 250 VAC

Relay Characteristics

Parameter	Value
Coil Voltage	24 VDC
Coil Resistance	2.88 k Ω
Coil Power	~200 mW
Coil Current	~8.3 mA
Operating Temperature	-40°C to +85°C
Contact Material	Silver Alloy (Cd-Free)

Mechanical Specifications

Parameter	Value
PCB Size	100 mm × 100 mm
Mounting	M3 holes
Output Count	8 channels

Output Operation

When a GPIO pin of the MCP23008 is set HIGH:

- The optocoupler LED turns on
- The optocoupler transistor activates
- The MOSFET driver stage switches ON
- The external load is energized

When the GPIO pin is LOW:

- Optocoupler is OFF
- Output transistor is OFF
- Load is de-energized



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Inductive Load Protection

Each output includes a flyback diode across the load driver to protect the switching transistor when driving inductive loads such as:

- relay coils
- solenoids
- contactors

Output Terminals

Channels:

- OUT1
- OUT2
- OUT3
- OUT4
- OUT5
- OUT6
- OUT7
- OUT8

I²C Interface

I²C IN

Signal order:

- SCL
- SDA
- 3.3V IN
- GND

I²C OUT

Signal order:

- GND
- 3.3V OUT
- SDA
- SCL

Allows cascading multiple modules on the same I²C bus.



EA Control Tech 8-Channel 24VDC Relay Output Module with Optocoupler Drivers

Control Header

Signals available:

- 3.3V OUT
- INT
- RESET
- GND
- GND

I²C Address Selection Auxiliary Control & Status Signals

Address	A2	A1	A0
0x20	OFF	OFF	OFF
0x21	OFF	OFF	ON
0x22	OFF	ON	OFF
0x23	OFF	ON	ON
0x24	ON	OFF	OFF
0x25	ON	OFF	ON
0x26	ON	ON	OFF
0x27	ON	ON	ON
0x20	OFF	OFF	OFF
0x21	OFF	OFF	ON
0x22	OFF	ON	OFF
0x23	OFF	ON	ON
0x24	ON	OFF	OFF

Up to 8 modules may share the same I²C bus.

I²C Pull-Up Configuration

JP3 / JP4 allow enabling onboard 3.3V pull-up resistors for:

- SDA
- SCL

Disable pull-ups if the bus already includes pull-ups elsewhere.

Power Source Selection (JP1 / JP2)

PS SOURCE jumper selects:

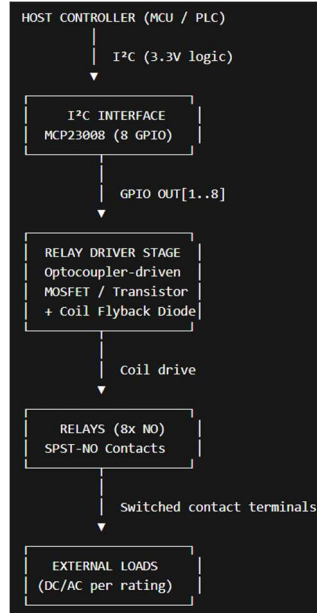
- BUS (use 3.3V from I²C bus), or
- EXT (use onboard 24V → 3.3V regulator)

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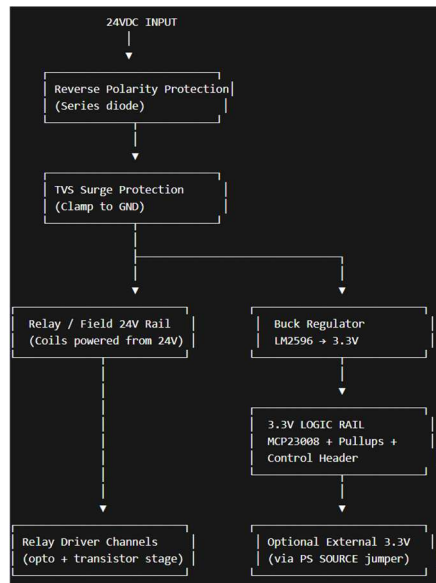
8-Channel 24VDC Relay Output Module with Optocoupler Drivers

Functional Block Diagram

System Architecture Overview



Power Architecture





EA Control Tech 8-Channel 24VDC Relay Output Module with Optocoupler Drivers

Operating Limits

This module is designed for use in 24VDC industrial control systems.

Recommended loads:

- relays
- solenoids
- lamps
- PLC inputs

Use appropriate wiring practices and disconnect power before modifying connections.

Output Rating

Maximum load current: 5 A per channel

Maximum load voltage:

- 30 VDC
- 250 VAC

Relay Type

Relay: **G5NB-1A-E-24VDC**

Contact type: SPST Normally Open

Coil voltage: 24 V

Coil current: ~8.3 mA

Connector

Output connector: WJ2EDGRC-5.08-2P

Typical rating: ~15 A per contact

EA Control Tech 8-Channel 24VDC Relay Output Module with Optocoupler Drivers

PCB Layout and Mechanical Dimensions

