







ECAT-2094S

EtherCAT 4-Axis Stepper Motor Controller/ Driver

A Features ■ Supports four stepper motors (2-phase bipolar) ■ Stepper motors are controlled in an open loop operation Programmable coil current level: up to 1.5 A/phase Programmable microstep size: maximum 256 microsteps per full step ■ Supported motor voltage range: 5 to 46 VDC ■ 4 × Encoder interfaces (A, B, Z), differential ■ 8 × Digital input. Two DI channels for each axis: reference switch input, latch input ■ 2 × Digital output Automatic current reduction to reduce heat when motor is not moving ■ Drive protection: □ Over-temperature □ Under voltage ☐ Short circuit Optically isolated I/O LED indicators for I/O, EtherCAT and motion status Internal memory for storing configuration data EtherCAT: □ 2 × RJ-45 bus interface □ Distance between stations up to 100 m (100BASE-TX) □ Support daisy chain connection ☐ EtherCAT conformance test tool verified □ Supports Free-Run, SM synchron and Distributed Clock (DC) operation modes Removable terminal block connector

Introduction

The ECAT-2094S stepper motor controller is a cost-effective, two-phase bipolar stepper driver. The ECAT-2094S simultaneously controls up to four stepper motors. A motor voltage range between 5 and 46V DC and a maximum motor coil current of 1.5 A/phase is being supported. For each motor the maximum running coil current, microstep resolution and other motion parameters are software selectable.

The ECAT-2094S is a standard EtherCAT slave and an EtherCAT master is required to operate the device. The ECAT-2094S supports three operation modes: Free-Run, SM-Synchron and Distributed Clock (DC).

Two-phase bipolar stepper motors can be directly connected to the ECAT-2094S device. The device is designed to operate the stepper motor in an open loop. Configuration has to be done by the EtherCAT master and the application program. Each stepper motor is being independently controlled by a separated driver IC. The four driver ICs are not synchronized and work independently from each other. The driver automatically controls the torque and position of the motor. An integrated ramp generator automatically calculates the acceleration and deceleration distance. In position mode the controller drives the motor to the target position and in velocity mode accelerates the motor to the target velocity. All motion parameters can be changed on the fly.

The ECAT-2094S has four integrated incremental encoder interfaces. Four 32 bit high frequency encoder counter counts the input signal of external incremental encoders. The encoder can for example be used for homing purposes and for consistency checks.

High resolution of up to 256 microsteps per full step is supported for a ensuring smooth and precise motor operation.

For each motor two digital input channels are provided. The digital inputs can be set to act as a simple DI, as a left and right hardware limit switch which automatically stops the motor when activated, or a latch trigger for latching the current motor and encoder position.

The module must be supplied by three power sources. Two motor supply and a 24Vdc control supply. Two motors share one power supply.

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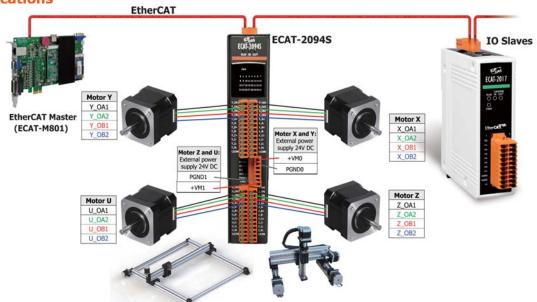
■ Hardware Specifications

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Output Current 1.5 A/phase Voltage Range of the Motor Output 5 to 46 Vpc Current Controller Frequency 24.5 MHz Maximum Step Frequency 8.388 MHz Microsteps Per Step Step Step Step Step Step Step Step	Motor Outputs						
Voltage Range of the Motor Output 5 to 46 VDC Current Controller Tesquency 24.5 kHz Maximum Step Frequency 8.388 MHz Minorsteps Reversion Step Tesquency 256,128,64,32,16,84,2 Recoder Inputs No. of Axes 4, differential Max. Encoder Pulser Frequency 4 MHz Digital Inputs Channels 8 (2 × Limit position for each motor) Protection of P	No. of Axes		4 × Stepper motor, 2 phases				
Current Controller Frequency 24.5 kHz Maximum Step Frequency 8.388 MHz Microsteps Per Sure	Output Current		1.5 A/phase				
Microsteps Per Steet 8.388 MHz Encoder Tupust Frequency A differential Max. Encoder Pulse Frequency 4 MHz Object Inputs Channels 8 (2 × Limit position for each motor) ON Votage Level OFF Voltage Level +5 VDC MAX Photo-isolation OFF Voltage Level OFF			5 to 46 VDC				
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No. of Axes	Maximum Step Fre	equency	8.388 MHz				
No. of Aves Max. Encoder Pulse Frequency Digital Inputs Channels	Microsteps Per Ste	p	256, 128, 64, 32, 16, 8, 4, 2				
Max. Encoder Pulse Frequency 4 MHz Digital Inputs Channels 8 (2 × Limit position for each motor) Wet Contact ON Voltage Level OFF Voltage Level Portlage Level Photo-Isolation 4 ND VOR MAX Photo-Isolation Digital Output Coutput Type 0 Open collector Load Voltage 45 to 30 VDC Max. Load Curent 100 mA Isolation Voltage Power, EtherCAT status, Digital IO, driving, temperature warning, over-temperature error, phase A and B under-voltage Communication Interface Connector 2 × RJ-45 Protocol EtherCAT EtherCAT Distance Between Stations Max. 100 m (1000BASE-TX) EthercAT Distance Between Stations Max. 100 m (1000BASE-TX) Strict Protocol Ethernet/EtherCAT Cable (Min. CAT 5), Shielded Power ET (IEC 61000-4-5) 4 KV Contact for each channel ETF (IEC 61000-4-5) 4 KV Contact for each channel ETF (IEC 61000-4-5) 5 Signal: 1 KV Class A; Power: 1 KV Class	Encoder Inputs						
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Mechanical Installation DIN-Rail Dimensions (W × L × H) 37 mm × 191 mm × 149 mm Casing Metal Environment -25 ~ +40°C Storage Temperature -30 ~ +80°C	EFT (IEC 61000-4-4)		Signal: 1 KV Class A; Power: 1 KV Class A				
Installation DIN-Rail Dimensions (W × L × H) 37 mm × 191 mm × 149 mm Casing Metal Environment Operating Temperature -25 ~ +40°C Storage Temperature -30 ~ +80°C	Surge (IEC 61000-4-5)		1 KV Class A				
Dimensions (W × L × H) $37 \text{ mm} \times 191 \text{ mm} \times 149 \text{ mm}$ Casing Metal Environment Operating Temperature $-25 \sim +40 ^{\circ}\text{C}$ Storage Temperature $-30 \sim +80 ^{\circ}\text{C}$	Mechanical	Mechanical					
Casing Metal Environment Operating Temperature -25 ~ +40°C Storage Temperature -30 ~ +80°C	Installation		DIN-Rail				
Environment Operating Temperature -25 ~ +40°C Storage Temperature -30 ~ +80°C	Dimensions (W × L × H)		37 mm × 191 mm × 149 mm				
Operating Temperature $-25 \sim +40^{\circ}\text{C}$ Storage Temperature $-30 \sim +80^{\circ}\text{C}$	Casing		Metal				
Storage Temperature -30 ~ +80°C	Environment						
	Operating Temperature		-25 ∼ +40°C				
Relative Humidity 10 ~ 90% RH, Non-condensing	Storage Temperature		-30 ∼ +80°C				
	Relative Humidity		10 ∼ 90% RH, Non-condensing				

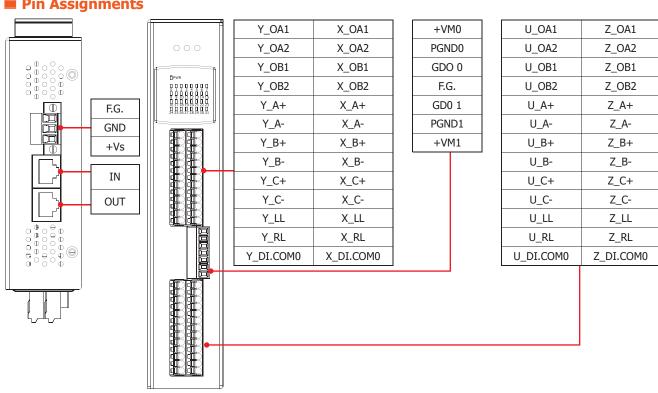
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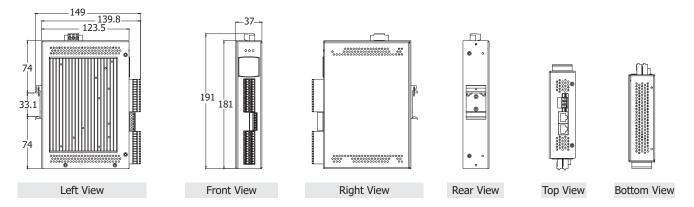
Applications



■ Pin Assignments



■ Dimensions (Units: mm)



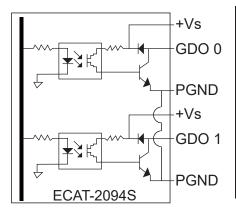
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Wire Connections

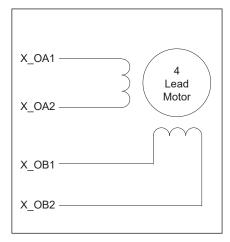
Digital Input Channel

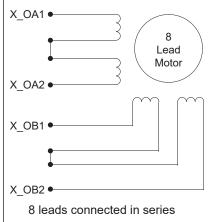
Digital Input	Readback as 1	Readback as 0
	+10 ~ +24 VDC	OPEN or <4 VDC
Sink	RL/LL 3K + - DI.COM	RL/LL 3K + - DI.COM
Source	+10 ~ +24 VDC	OPEN or <4 VDC
	RL/LL 3K	RL/LL 3K

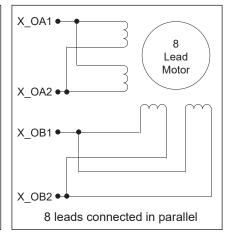
Digital Output Channel



Output Type	ON State Readback as 1	OFF State Readback as 0
Drive Relay	+Vs GDO 0 PGND	+Vs GDO 0 PGND
Resistance Load	+Vs GDO 0 PGND	+Vs GDO 0 PGND







■ Ordering Information

ECAT-2094S CR EtherCAT slave 4-axis stepper motor controller/driver (RoHS)