ECAT-2091S

EtherCAT Single Axis Stepper MotorController/Driver

Features

- 1 x Stepper motor (2-phase bipolar stepper motor)
- Drive capability up to 1.5 A/phase coil current (with proper cooling and airflow up to 2.0 A/phase)
- Voltage range of the motor: 5 to 46 VDC
- 1 x 5V power supply for encoder. Limitation: the output current should not exceed 150mA
- 1 x Encoder interfaces (A, B, Z), differential
- 2 x Digital input: Reference switch input, latch input
- 1 x Digital output
- Highest resolution: 256 microsteps per full step
- Automatic current reduction to reduce heat when motor is not moving
- Over-temperature protection
- Optically isolated I/O
- LED indicators for I/O, EtherCAT and motion status
- EtherCAT:
  - 2 x 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-2091S stepper motor controller is a cost-effective, two-phase bipolar stepper driver. A motor voltage range between 5 and 46 VDC and a peak motor coil current of 1.5 A/phase without cooling is being supported. When operating in a properly ventilated environment (cooling fan) the ECAT-2091S can drive the motor at a current level of up to 2.0 A/phase. The maximum running motor current, microstep resolution and other motion parameters are software selectable.

The ECAT-2091S is a standard EtherCAT slave and an EtherCAT master is required to operate the device. The ECAT-2091S supports three operation modes: Free-Run, SM synchron and Distributed Clock (DC).

Two-phase bipolar stepper motors can be directly connected to the ECAT-2091S device. The device is designed to operate in a open loop. Configuration and motion control has to be done by the EtherCAT master and the application program. The coil current and step control is beina done by a stepper motor driver IC. 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. A minimum set of configuration data consists of acceleration, deceleration and maximum motion velocity. After receiving the target position the motor driver starts controlling the motion movement. All motion parameters can be changed on the fly.

The ECAT-2091S has a 32 bit high frequency encoder counter which counts the input signal of an external incremental encoder. 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.

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 two power sources. A motor supply and a 24 VDC control supply.

Applications

■ Hardware Specifications

Motor Outputs	
No. of Axes	1 × Stepper motor, 2 phases
Output Current	peak 1.5 A/phase (with proper airflow up to 2.0 A/phase)
Voltage Range of the Motor Output	5 to 46 V$_{DC}$
Current Controller Frequency	24.5 kHz
Maximum Step Frequency	8.388 MHz
Microsteps Per Step	256, 128, 64, 32, 16, 8, 4, 2

Encoder		
No. of Axes		1, differential
Max. Encoder Pulse Frequency		4 MHz
Power Supply		5V (Restriction: the output current should not exceed 150 mA)

Digital Inputs		
Channels		2
Wet Contact	ON Voltage Level	+19 to 30 V$_{DC}$
	OFF Voltage Level	+11 V$_{DC}$ MAX
Photo-isolation		3750 V$_{DC}$

Digital Output	
Number of Digital Outputs	1
Output Type	Open collector
Load Voltage	+5 to 30 V$_{DC}$
Max. Load Current	100 mA
Isolation Voltage	3750 V$_{DC}$

LED Indicators	
Diagnostic LED	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
Distance Between Stations	Max. 100 m (100BASE-TX)
Data Transfer Medium	Ethernet/EtherCAT Cable (Min. CAT 5), Shielded

Power	
Input Voltage Range	20 V ~ 30 V$_{DC}$

EMS Protection	
ESD (IEC 61000-4-2)	4 KV Contact for each channel
EFT (IEC 61000-4-4)	Signal: 1 KV Class A; Power: 1 KV Class A
Surge (IEC 61000-4-5)	1 KV Class A

Mechanical	
Installation	DIN-Rail
Dimensions (W× L × H)	33 mm × 120 mm × 117 mm
Casing	Metal

Environment	
Operating Temperature	-25 ~ +40°C
Storage Temperature	-30 ~ +80°C
Relative Humidity	10 ~ 90% RH, Non-condensing

■ Pin Assignments

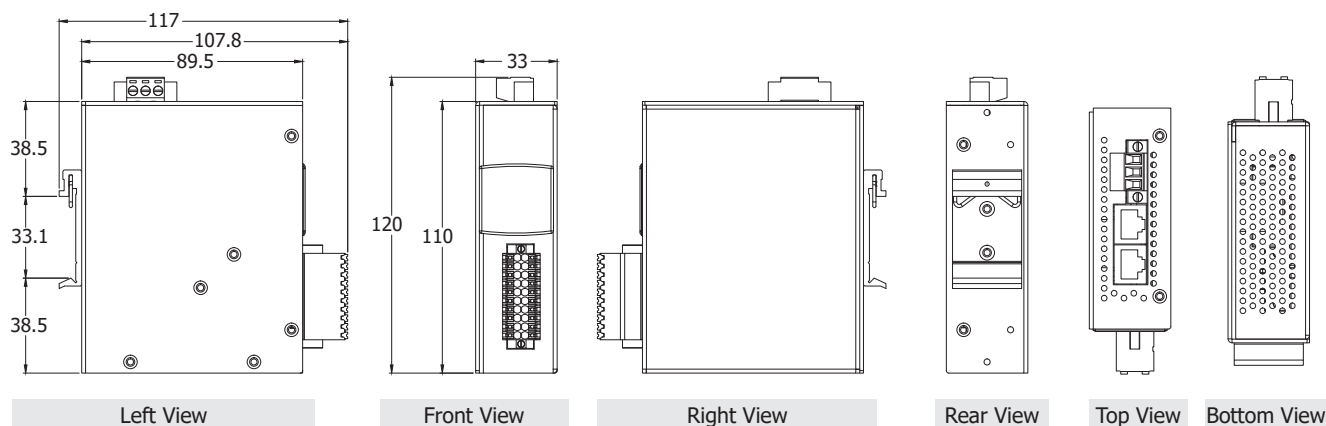| Name	Signal	Signal Description
OA1	Output	Motor winding A1
OA2	Output	Motor winding A2
OB1	Output	Motor winding B1
OB2	Output	Motor winding B2
LL	Input	Left limit switch for motor
RL	Input	Right limit switch for motor
GDO0	Output	General purpose digital output channel 0
DI.COM		Common DI supply: 0V or +10 to +24 VDC (0V for current sinking)
+VS		+24 VDC
GND		Ground 0V

Name	Signal	Signal Description
A+	Input	Encoder input A+
A-	Input	Encoder input A-
B+	Input	Encoder input B+
B-	Input	Encoder input B-
C+	Input	Encoder input C+
C-	Input	Encoder input C-
+5V	Output	Power supply to encoder Limitation: • The output current should not exceed 150mA • Only one encoder should be connected
+VM	Input	Motor power supply +5 to 46 VDC (from positive power contact)
+VS		+24 VDC
GND		Ground 0V

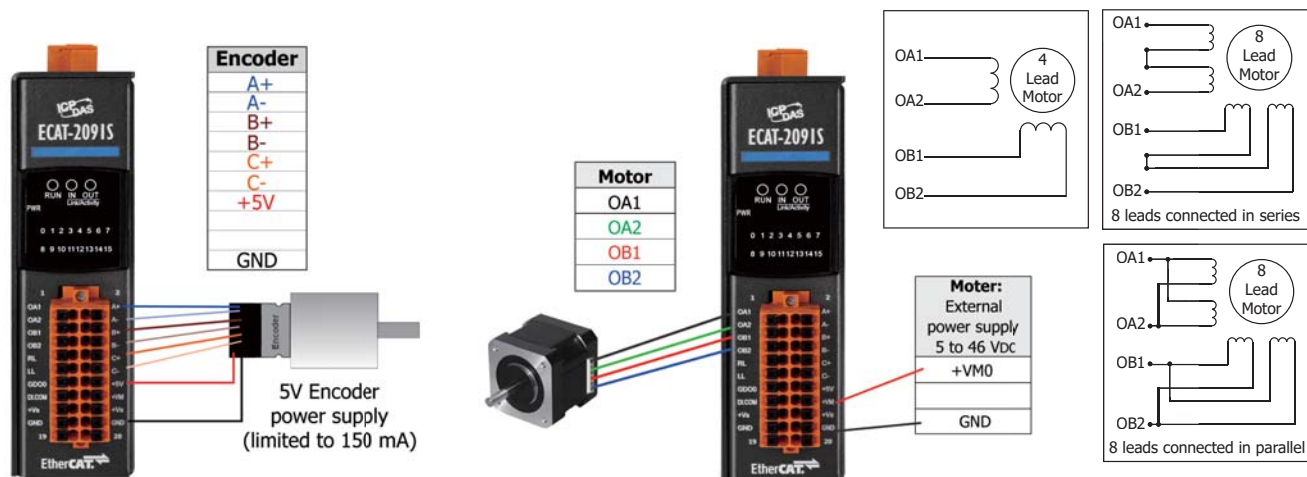| Name	Signal
F.G	Frame ground
GND	Power supply: Ground 0V (from negative power contact)
+Vs	Power supply: +24 VDC (from positive power contact)
IN	EtherCAT signal input
OUT	EtherCAT signal input

■ Dimensions (Units: mm)

Left View | Front View | Right View | Rear View | Top View | Bottom View

117
107.8
89.5
38.5
33.1
38.5
33
120
110

▤ Wire Connections

Encoder
A+
A-
B+
B-
C+
C-
+5V
GND

5V Encoder power supply (limited to 150 mA)

Motor
OA1
OA2
OB1
OB2

Moter: External power supply 5 to 46 VDC
+VM0
GND

8 leads connected in series

8 leads connected in parallel

Digital Input Channel

Digital Input	Readback as 1	Readback as 0
Sink	+10 ~ +24 VDC	OPEN or <4 VDC
Source	+10 ~ +24 VDC	OPEN or <4 VDC

Digital Output Channel

ECAT-2091S

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

▤ Ordering Information

ECAT-2091S CR	EtherCAT single axis stepper motor controller/driver (RoHS)