# ECAT-2093

## EtherCAT Three-Channel Incremental Encoder Counter

### ⊞ Features

- ■ EtherCAT slave
- ■ Three channels, 32-bit incremental encoder counters
- ■ Encoder counting mode: CW/CCW , Pulse/Direction, A/B Phase
- ■ Maximum counting rate: 4 MHz
- ■ Encoder Input: A, B, Z differential or single-ended signals
- ■ Index latch counter value
- ■ Digital input filter
- ■ Input level:  5V, 12V/24V with internal resistor
- ■ Polarity setting by software for active high or active low encoder input
- ■ A/B/Z signal isolation voltage: 2500V optical isolation
- ■ LED indicators for EtherCAT and encoder 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

### ☑ Introduction

The EtherCAT slave ECAT-2093 is an incremental encoder counter which provides three independent high-speed counter channels. It reads the pulse train generated by an incremental encoder and can be used in positioning feedback applications. Each channel has two counter inputs. The inputs can either be single-ended or differential signals. Three counting modes are supported: clockwise/counterclockwise, pulse/direction and quadrant counting mode. The hardware index latch function allows the latching of encoder position. Low pass filter functions for filtering out electrical noises are provided.

### ☑ Hardware Specifications

| Model | Specification |
|---|---|
| **Encoder** | |
| Number of encoder inputs | 3 × encoder counter (A, B, Z), differential or single-ended |
| Resolution | 32 bit |
| Maximum input pulse frequency | 4 MHz |
| Input level: | 5V (default) |
| | 12V/24V with internal resistor (set by jumper) |
| Photo-Isolation | 2500 V$_{DC}$ |
| **LED Indicators** | |
| Diagnostic LED | Power, EtherCAT status, signal status of each encoder input |
| **Communication Interface** | |
| Connector | 2 x 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 VDC ~ 30 VDC |
| Power consumption | Maximum 4.5W |
| **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 |
| **Mechanism** | |
| Installation | DIN-Rail |
| Dimensions (L × W × H) [mm] | 110 mm × 90 mm × 33 mm (without connectors) |
| Case material | UL 94V-0 housing |
| **Environment** | |
| Operating Temperature | -25 ~ +70°C |
| Storage Temperature | -30 ~ +80°C |
| Relative Humidity | 10 ~ 90% RH, Non-condensing |

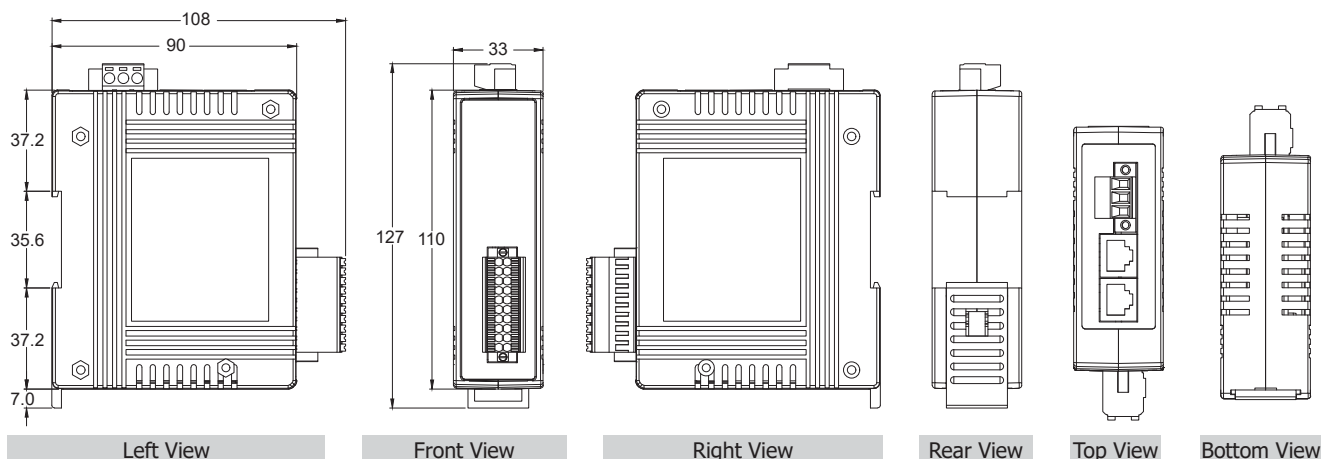Table 1: Technical data

## ☑ Dimensions (Units: mm)



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

Figure 1: Dimensions of the ECAT-2093

## ☑ Connection Interfaces



| 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 output |

Figure 2: ECAT-2093 side view with power supply and EtherCAT connection

Table 2: ECAT-2093 power supply and EtherCAT interfaces



| Name | Signal | Signal Description | |
|------|--------|-------------------|---|
| A0+ | Input | Encoder input A0+ | Encoder Channel 0 |
| A0- | Input | Encoder input A0- | |
| B0+ | Input | Encoder input B0+ | |
| B0- | Input | Encoder input B0- | |
| Z0+ | Input | Encoder input C0+ | |
| Z0- | Input | Encoder input C0- | |
| A1+ | Input | Encoder input A1+ | Encoder Channel 1 |
| A1- | Input | Encoder input A1- | |
| B1+ | Input | Encoder input B1+ | |
| B1- | Input | Encoder input B1- | |
| Z1+ | Input | Encoder input C1+ | |
| Z1- | Input | Encoder input C1- | |
| A2+ | Input | Encoder input A2+ | Encoder Channel 2 |
| A2- | Input | Encoder input A2- | |
| B2+ | Input | Encoder input B2+ | |
| B2- | Input | Encoder input B2- | |
| Z2+ | Input | Encoder input C2+ | |
| Z2- | Input | Encoder input C2- | |

Table 3: Connection interfaces of the encoder counter

Figure 3: ECAT-2093 front view with encoder inputs
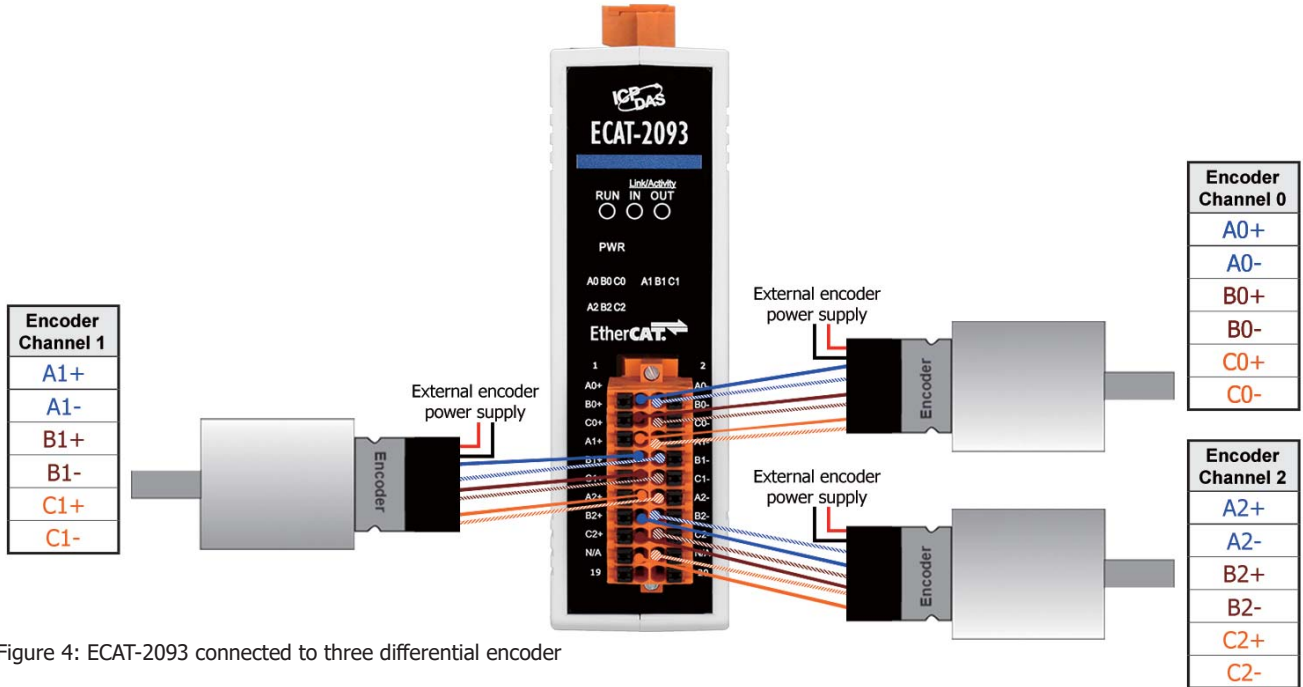
ECAT-2093

## ☑ Wire connection



Figure 4: ECAT-2093 connected to three differential encoder

## ☑ Digital Input Channel

The ECAT-2093 can accept encoder input from either differential or single-ended signals.

By default it is set to support differential encoder signals as they are preferred due to their excellent noise immunity. For single-ended encoder connection the ECAT-2093 provides an internal 1k Ohm resistor for each signal input. The internal resistor can be selected via jumper setting.
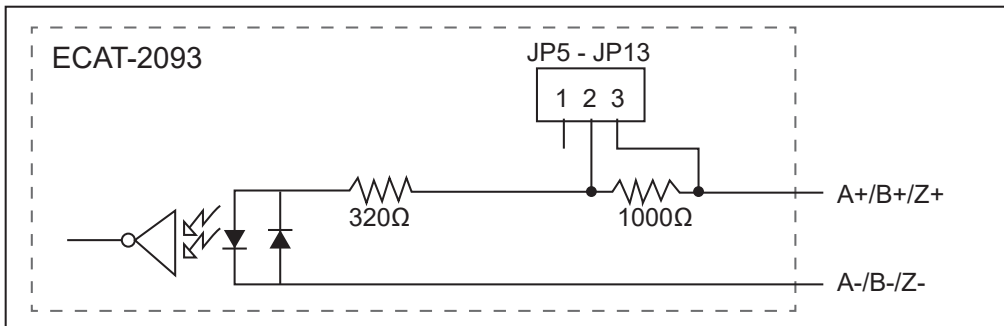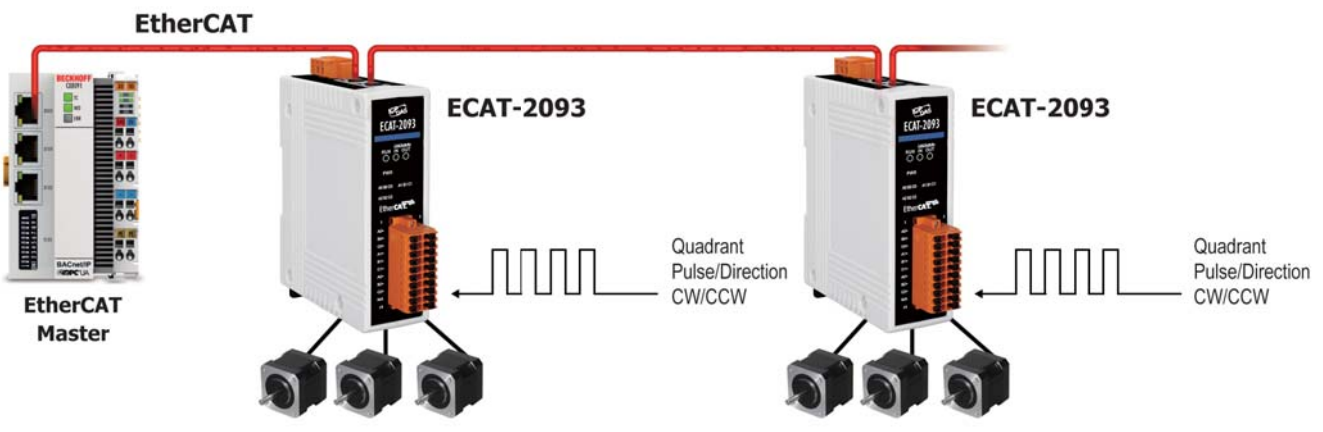


Figure 5: Encoder input channel circuit

## ☑ Application

## ☑ Counting Modes

The ECAT-2093 encoder counter supports three modes:

- Pulse/Direction counting mode
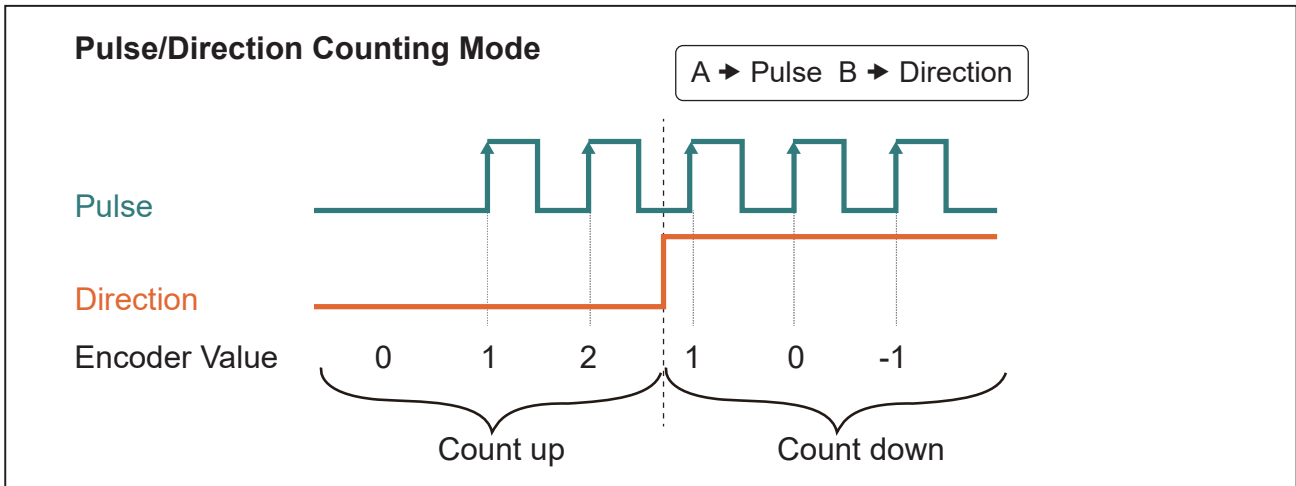- Clockwise/Counterclockwise mode
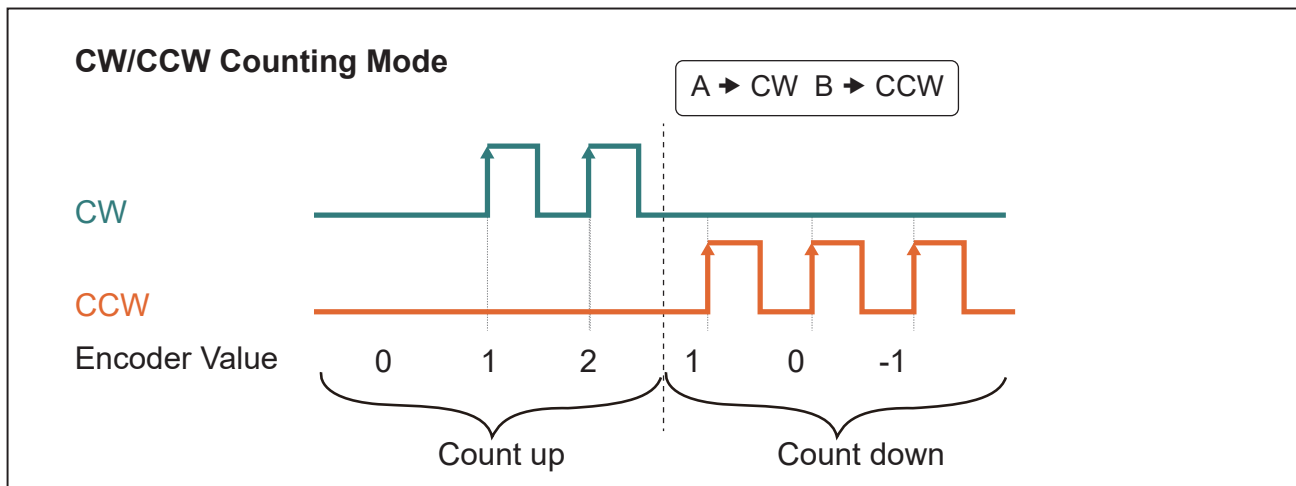- Quadrant counting mode

### Pulse/Direction Counting Mode

A ➔ Pulse   B ➔ Direction

Pulse

Direction

Encoder Value    0    1    2    1    0    -1

Count up        Count down

Figure 6: Pulse/Direction counting mode

### CW/CCW Counting Mode

A ➔ CW   B ➔ CCW

CW

CCW

Encoder Value    0    1    2    1    0    -1

Count up        Count down

Figure 7: Clockwise/ Counterclockwise counting mode

### Quadrant Counting Mode 4x

A ➔ A   B ➔ B

A

B

Encoder Value    0   1   2   3   4    3   2   1   0   -1   -2
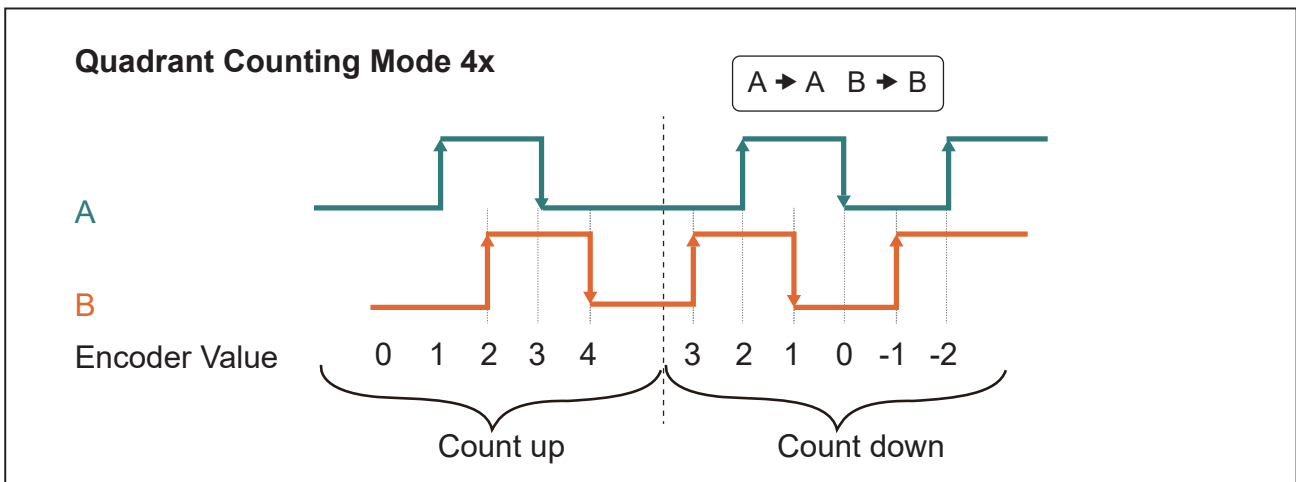
Count up         Count down

Figure 8: Quadrant counting mode

## ☑ Ordering Information

| ECAT-2093 CR | EtherCAT three-channel incremental encoder counter |
|---|---|