EcoEFI

Engine Control Unit (ECU)
Technical Spec

ECOTRONS LLC

Note: If you are not sure about any specific details, please contact us at info@ecotrons.com.

Product：　　　　Engine Control Unit

Type：　　　　　EC4T2CTHIGIA

Comment：　　　All the data in the document are tests under

normal conditions

Index	Page	Revision	Date	Note
1	----	**First Edition**	5.19.2015	V1.1
2	----	**Second Edition**	2.15.2017	V1.2

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1 Overview

The core part of Ecotrons ECU is **FreeScal**e's 16 bit or 32 bit microprocessor that is specifically designed for powertrain controls. ECU also includes some Application Specific Integrated Circuits, or ASIC chips, from world famous automotive semiconductor manufacturers, like **Infineon**, and **International Rectifier** etc. Most importantly, Ecotrons' ECU contains the state-of-art engine control software which combines both efficiency and flexibility of the modern engine control technology.
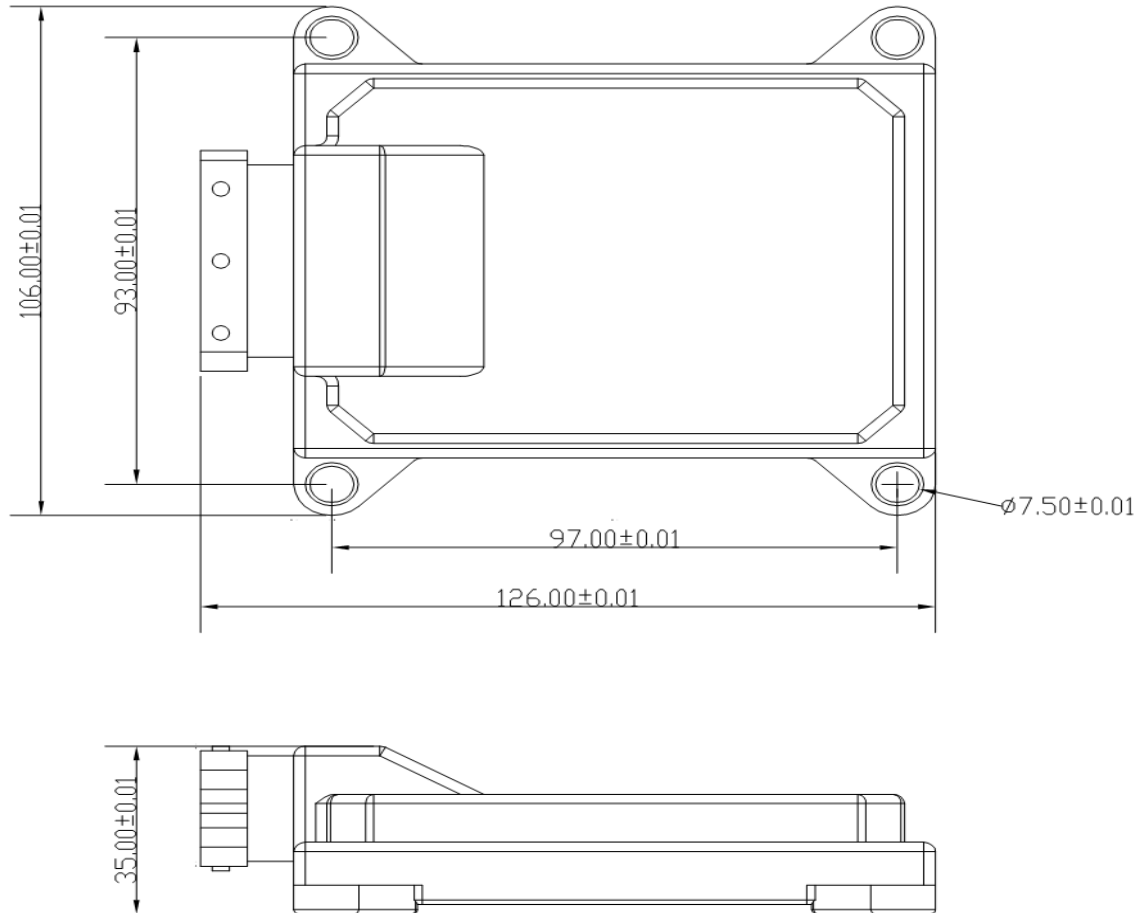
Ecotrons has a few small engine ECUs; all small sizes and light weight. One is like the below picture, water proof.
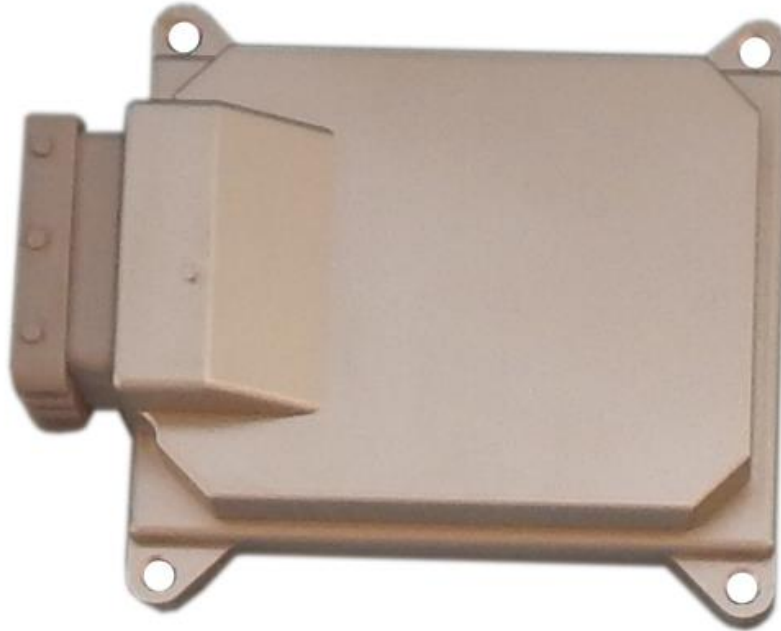
2 Characteristic and principle

2.1 Characteristics

- The 24-pin ECU with an aluminum shell is sealed by pouring sealant. And there are mounting holes on the shell.

- ECU shape size.

2.2 Working Principle

ECU judges the working state of the engine through the sensor measuring data acquisition and calculation. ECU performs Optimization and control tasks according to the existing and stored calibration data.

3 Technical Parameters

Voltage range	9~16VDC
Current	≤260mA
Storage temperature	-40~125℃
Working temperature	-40~125℃
The product weight	≤250g

4 Installations

4.1 Installation location

In order to ensure a high reliability, ECU installation should abide by the following principles:

- Mounting position of ECU should have adequate ventilation.
- Avoid the heat transmission to the ECU.
- Away from the ignition system, the EMI is serious.
- It should be installed firmly.
- Avoid the dirty, wet, and splash water.
- Don't let the ECU to prop up the wiring harness.
- Wiring harness should avoid wear and heat.

4.2 Temperature Adaptability
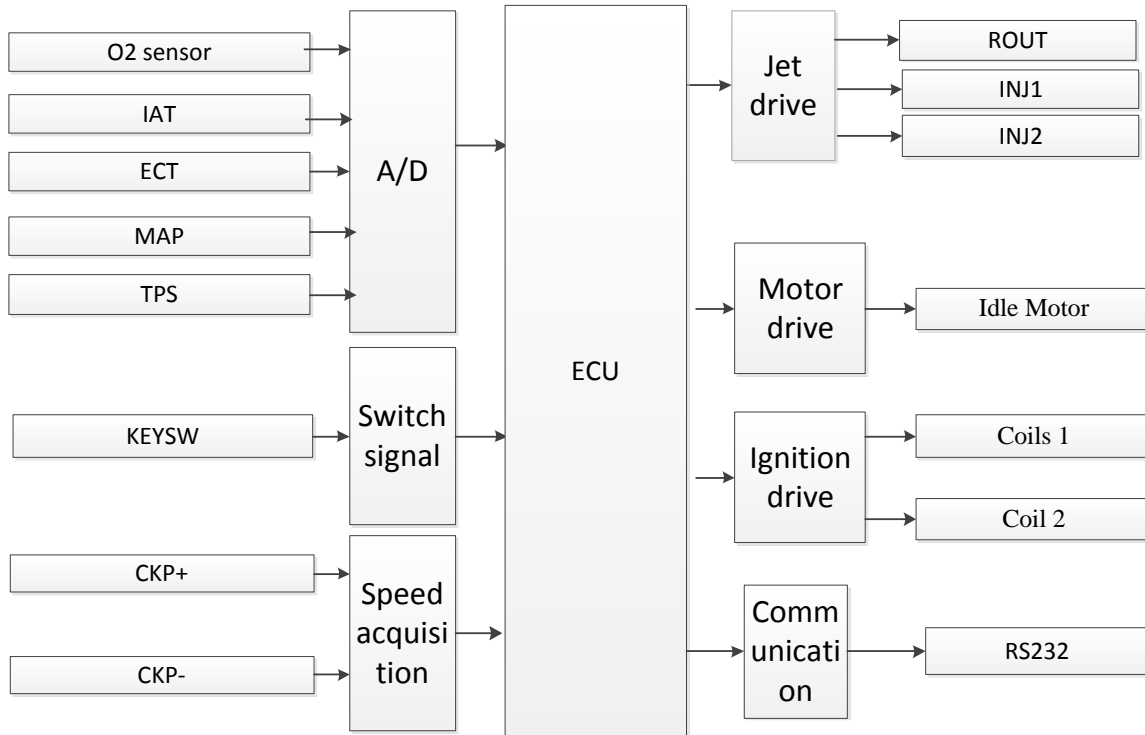
The temperature of location must under the limit (125 ^{o}C at any time.

4.3Waterproof Requirements

- The water cannot gather near the ECU connector. It may cause a short.
- All the possibility of contact with water should be ruled out.

5 The Instructions

5.1 System Function

```
O2 sensor ─┐
IAT ───────┤
ECT ───────┤ A/D ──→ ┐
MAP ───────┤         │
TPS ───────┘         │
                     │        Jet drive ──→ ROUT
KEYSW ──→ Switch signal ──→ ECU            ──→ INJ1
                     │                     ──→ INJ2
CKP+ ─┐              │        Motor drive ──→ Idle Motor
CKP- ─┘ Speed acquisition     Ignition drive ──→ Coils 1
                                            ──→ Coil 2
                              Communication ──→ RS232
```

Abbreviation:

IAT: Intake Air Temperature Sensor

ECT: Engine (Coolant) Temperature or Cylinder Head Temperature Sensor

MAP: Manifold Absolute Pressure Sensor

TPS: Throttle Position Sensor
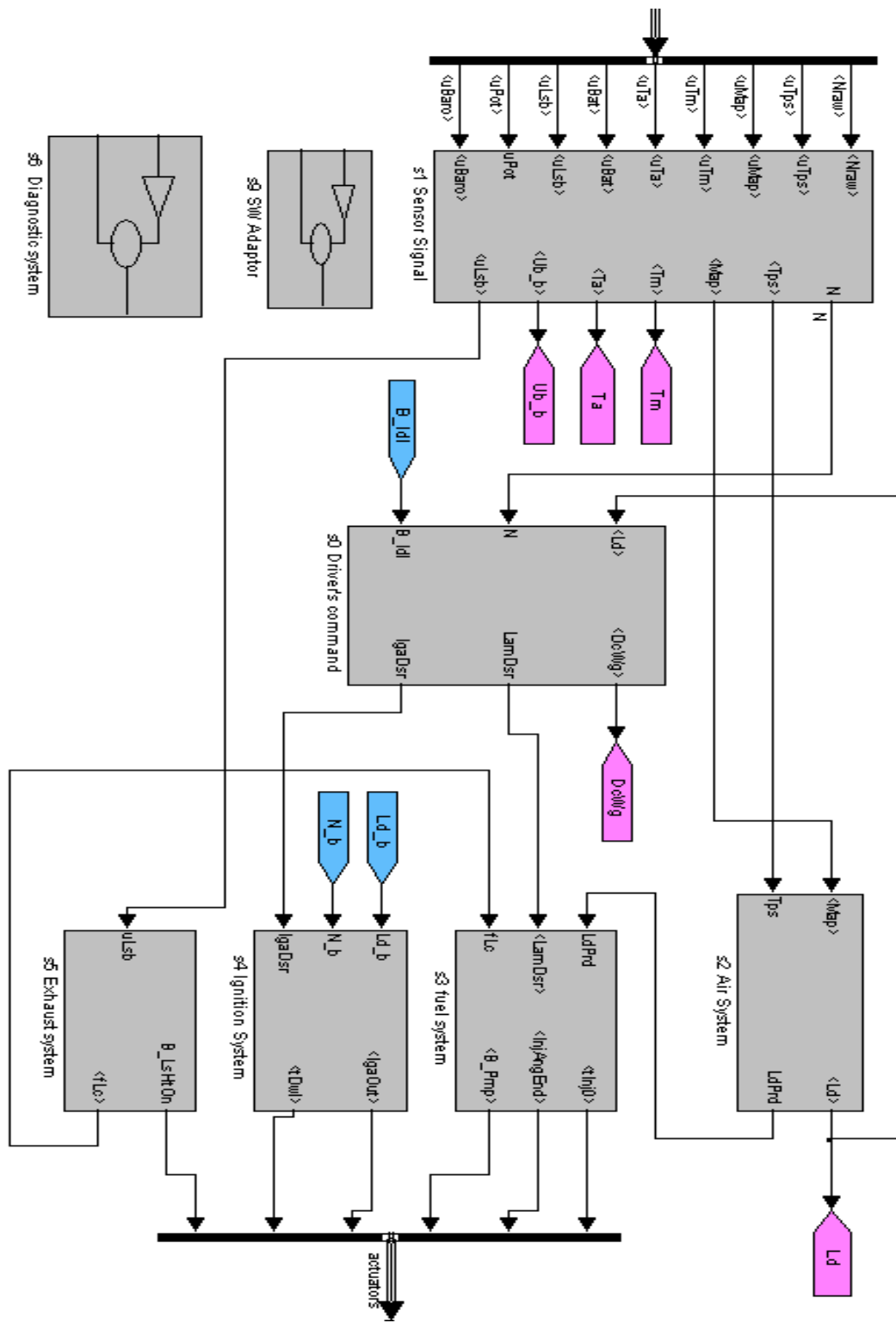
KEYSW: Key Switch or Ignition Switch input

CKP: Crank Position Sensor

ROUT: Relay control Output

INJ: Injector control output

Coil: Inductive ignition coils

Control Strategy Block Diagram:

Control Strategy Block Diagram (as above)

Major control strategies:

- Charge detection and prediction.

- Fuel injection controls.

- Ignition system controls.

- Fuel pump controls.

- EVAP emission controls.

- Transient fuel compensations.

- Decel-fuel-cut-off.

- Altitude compensations.

- Temperature compensations (winter, summer, etc.).

- Engine protections.

- Diagnostics and serial communications.

5.2 ECU Pin Definition and Description

ECU Port Description：
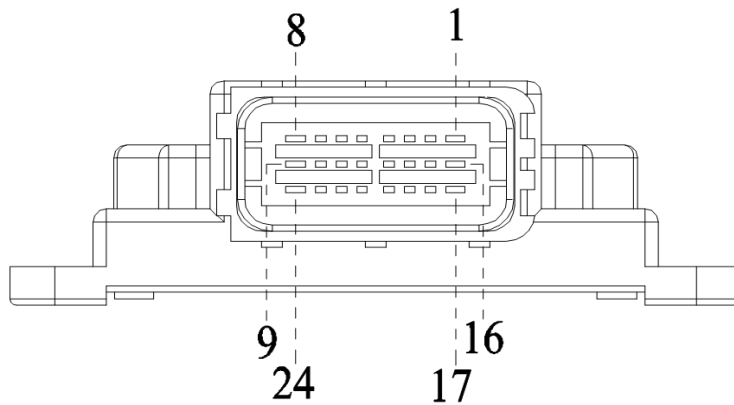
Number	Define	instructions	input/output	Voltage range
1	O2HOUT1	Oxygen sensor input	output	0~16V
2	+12V	Battery terminal positive	Input	9~16V
3	IACC	Idle speed motor drive C	output	0~16V
4	VCC	5v power supply output	output	5V

| 5	RXD	serial port communication sender	output	-15~+15V
6	IACA	Idle speed motor drive A	output	0~16V
7	TPS	Throttle position sensor	Input	0~5V
8	GND-A	Sensor ground	output	0
9	CKP-	The negative of crank position sensor input	output	0~16V
10	MAP	Manifold air pressure	Input	0~5V
11	IACD	Idle speed motor drive D	output	0~16V
12	TXD	serial port communication receiver	Input	-15~+15V
13	IAT	Intake air temperature sensor input	Input	0~5V
14	KEYSW	Key switch	Input	0~16V
15	INJ2	Fuel injector # 2 driver output	Output	0~16V
16	INJ1	Fuel injector # 1 driver output	Output	0~16V
17	GND-P	Power ground	Output	0
18	COIL1	Ignition Coil #1 driver output	Output	0~16V
19	COIL2	Ignition Coil #2 driver output	Output	0~16V
20	ROUT	fuel pump relay driver output	Output	0~16 V
21	ECT	The engine temperature sensor	Input	0~5 V
22	IACB	Idle speed motor drive B	Output	0~16V
23	O2IN1	Oxygen sensor input	Input	0~1V
24	CKP+	The positive of crank position sensor input	Input	2~150V

5.3 ECU function module

5.3.1 Analog Signal Acquisition Channel

AD conversion channel can convert analog signals from sensor to digital signals. The ECU can get signals from the sensors, like the air temperature sensor, engine temperature sensor, air pressure sensor, throttle position sensor and oxygen sensor signal.

5.3.2 CKP Signal Acquisition

The CKP signal is extracted from the engine ignition trigger sensor, the voltage of original signal is high, so it must be converted into a 0~5V digital pulse voltage, can be processed to identify ECU, then ECU can get the information of engine speed and piston position . The voltage of signal from trigger sensor must be higher than 2V.

5.3.3 Fuel Injector Drive
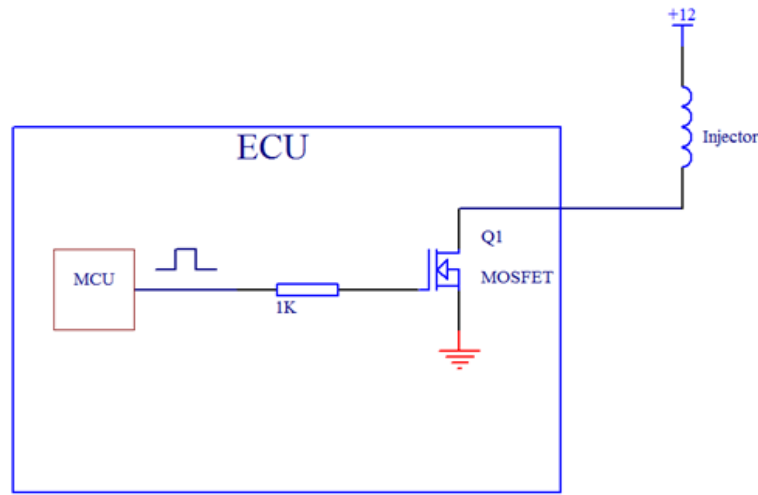
Fuel injector drive circuit

MCU can control the MOSFET to be ON or OFF, and then the injector will be ON or OFF. So the ECU can control the injector to inject the accurately fuel. For gasoline engine, the stoic AFR (air/fuel ratio) is 14.7.

5.3.4 Ignition control

In ECU, MCU can control the IGBT to be ON and OFF, and then the ignition coil will be charging and fire. So the ECU can control the ignition coil to fire at a suitable ignition timing.

Note: the EC4T2CTHIGIA ECU cannot driver a CDI directly.

5.4 Matters Needing Attention

- In the installation, the ECU should be installed at the end to reduce the damage of the electrostatic.
- The power supply should be disconnected before the ECU is installed.
- For the first time to use the ECU, in order to get the right TPS information,

please operate as following:

- ✧ Close the throttle , in the idle position;
- ✧ Key on, waiting for more than 5 seconds;
- ✧ Open the throttle fully, waiting for more than 5 seconds;
- ✧ Close the key switch, waiting for more than 5 seconds.
- ● Try to avoid ECU suffered more than 16V voltages.
- ● ECU should be stored in a dry, dust-free environment, not exposed to any liquid waste.

6 Malfunction Indicator and Elimination

The fault phenomenon	Cause analysis	Elimination method
Trouble light shining	Parts are bad	According to the software read failure
After open the key switch, oil pump does not work	1. The ECU without electricity 2. The relay is damaged 3. The ECU has been damaged	1. Check the red power cord and fuse 2. Replace the relay 3. Replace the ECU

7. Appendix: Mechanical CAD Size