



EV22297A Datasheet

V 1.5

Revision History

Date	Version	Description
02/2022	V 1.0	First release
02/2022	V1.1	Add analog input channels
03/2022	V1.2	Add mechanical mounting instruction, 7 analog input channels, BootLoader default settings, instruction on CAN flashing. Add sensor power supply turned-on option. Modify links of connector kits
05/2022	V1.3	Added 3 analog input channels, redefined the CAN pin definition and terminal resistors, revised pin definitions of KEYON and WAKE signals
06/2022	V1.4	Modify the EMC test standard, modify the maximum current of the low-side channel, modify 5V3-5V6 power supply current, add wheel speed sensor 8V power supply, add automotive Ethernet description
07/2022	V1.5	Change CAN name that supports wake-up for specific frames, CAN supported protocol. Change the 5V sensor power supply description. Not support external active-low wake-up. Change LIN name

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Chapter 1 General Information

1.1 Introduction

VCU (Vehicle Control Unit) is the master controller for electric and hybrid vehicles. Its core functions include power on/off management, power system management, drive mode management, drive and brake control, auxiliary management, fault diagnosis, etc. VCU is the main control unit for vehicle control network or CAN network.

1.1.1 Functionality

EV22297A has the following functions:

Table 1.1.1.1 EV22297A Features

Feature
1 Key switch (KEYON)
2 Active-high hardwire wakeup (WAKE1, WAKE2)
5 Power supply (BATT)
6 5V Outputs
4 channels of 8V wheel speed sensor power outputs
6 CAN Bus ports: All supports CAN flashing. CANA-CAND support ISO 11898/CANFD. CANE and CANF support standard CAN and specific frame wake-up
2 LIN Bus port
1 Automotive Ethernet port
13 Digital signal inputs: 7 channels active high, 6 channels active low
22 Analog signal inputs: 10 channels of 0-5V voltage type input, 4 channels of 0-5V resistor type input, and 8 channels of 0-32V voltage type input
4 Frequency signal inputs: all digital input configurable, 2 active-high and 2 active-low.
10 High-side driver outputs: 2 Pulse-Width-Modulation (PWM) output configurable
18 Low-side driver outputs: 4 PWM output configurable
Hardware watchdog

1.1.2 Mechanical Specification

The housing of VCU is formed by aluminum die-casting and assembled with silicone rubber seals. There is no special treatment or plating on the surface, no sharp burrs, or sharp edges. The dimensions of the VCU housing are as follows (excluding the female end of the VCU connector, in mm):

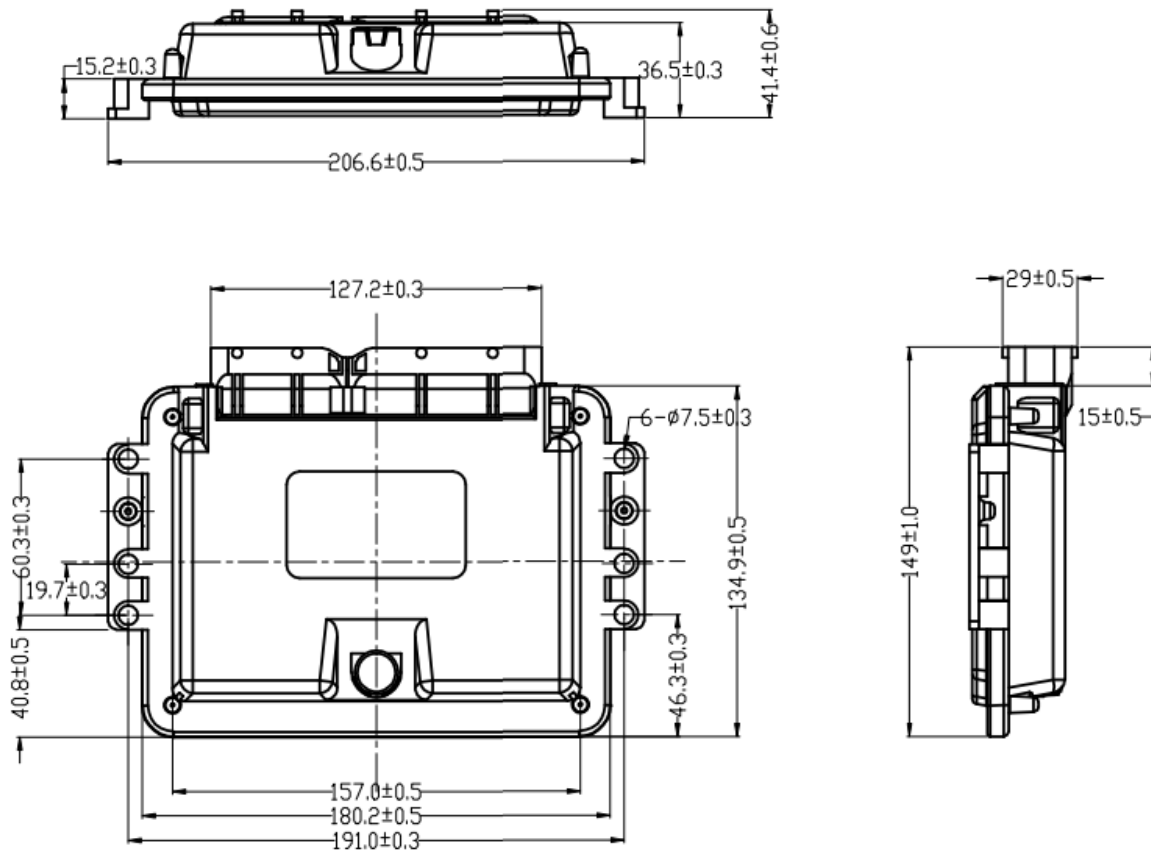


Figure 1 VCU Housing Size

The appearance of the housing is as follows:



Figure 2 VCU Housing Appearance

The type of screwdriver that used for disassembling the housing: Torx T15.

The product identification label is affixed to the VCU housing, which contains the product identification code, customer information, date, batch number, serial number, etc.

1.1.3 Connector Kits

VCU uses the world-renowned “TE connectivity” brand connector kits, which is a qualified product that meets the automotive safety level and has 121 pins. The specific models of the connector kits are as follows.

Table 1.1.3.1 Harness Connector Info

#	Name	Part number	Supplier	URL
1	PCB Pin Seat	1746979-1	TE	https://www.te.com/usa-en/product-1746979-1.html
2	81P Housing	1473244-1	TE	https://www.te.com/usa-en/product-1473244-1.html
3	40P Housing	1473252-1	TE	https://www.te.com/usa-en/product-1473252-1.html
4	81P Cover Assembly	1473247-1	TE	https://www.te.com/usa-en/product-1473247-1.html
5	40P Cover Assembly	1473255-1	TE	https://www.te.com/usa-en/product-1473255-1.html
6	81P TPA	368382-1	TE	https://www.te.com/usa-en/product-368382-1.html
7	40P TPA	368388-1	TE	https://www.te.com/usa-en/product-368388-1.html
8	Terminal (wire diameter 0.2-0.35)	5-968220-1	TE	https://www.te.com/usa-en/product-5-968220-1.html
9	Terminal (wire diameter 0.75-1.0)	964286-2	TE	https://www.te.com/usa-en/product-964286-2.html

Connector’s Pin distribution is shown below:

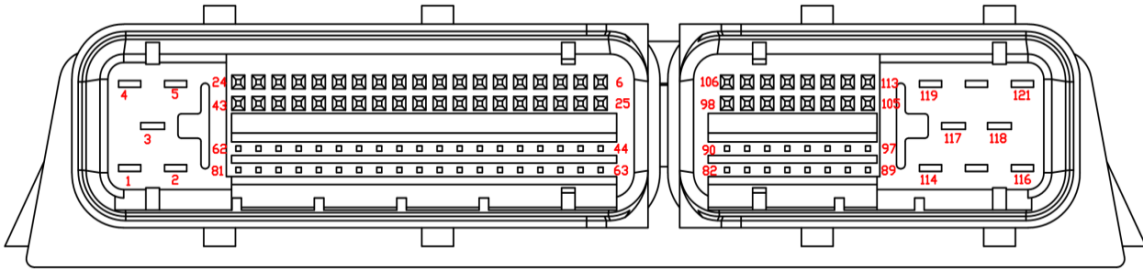


Figure 3 Connector's Pin Distribution Diagram

1.1.4 Chip Information

Table 1.1.4.1 Chip Info

Feature	Detail
Micro Control Core	32-bit Infineon TC297TP
Maximum Frequency	300MHZ
Flash	8M
SRAM	728K
EEPROM	512Kbit
SBC	TLF35584QVVS2

1.1.5 Power Supply

EV22297A requires 5 channels of continuous power supplies (pin121, pin118, pin116, pin1 and pin3), and the VCU is powered on through the KEYON switch (pin59).

EV22297A power fuse: Connect all power supply pins in parallel, then connect with a 10A fuse in series.

1.1.6 BootLoader

The default BootLoader of EV22297A uses UDS protocol.

Chapter 2 Interface Description

2.1 Pin Definition

Table 2.1.1 Pin Definition

Signal Name	PIN	Function	Interface Description	Note
Power Supply				
BATT	1 3 116 118 121	Power Supply	Power Supply 12V/24V (9-32V)	Power supply pins should be connected to external power supply
8V	6	8V Sensor Supply	External Sensor 8V Power Supply. All 8V channels must be configured by EcoCoder "Power Control Output" Block, before channel is enabled.	Single Channel Output $8V \pm 2\%$, Sum of Four Channels Maximum 500mA
8V	25	8V Sensor Supply		
8V	47	8V Sensor Supply		
8V	66	8V Sensor Supply		
5V1	83	5V Sensor Supply 1		$5V \pm 2\%$, 5V1-5V2 Maximum 150 mA
5V2	86	5V Sensor Supply 2		
5V3	82	5V Sensor Supply 3	External Sensor 5V Power Supply, All 5V channels must be configured by EcoCoder "Power Control Output" Block, before channel is enabled	$5V \pm 2\%$, 5V3-5V6 Maximum 250 mA
5V4	84	5V Sensor Supply 4		
5V5	85	5V Sensor Supply 5		
5V6	87	5V Sensor Supply 6		
PGND	120 119 117 2 4 5	Ground	Power Ground	

GND	45 48 50 51 63 64 65 67 69 70 71	Signal Ground	Ground for all signals	
Analog Input				
AI01	42	Analog Input 01	Analog Signal Input 0~5V, voltage type	12-Bit Precision
AI02	60	Analog Input 02	Analog Signal Input 0~5V, voltage type	12-Bit Precision
AI03	43	Analog Input 03	Analog Signal Input 0~5V, voltage type	12-Bit Precision
AI04	24	Analog Input 04	Analog Signal Input 0~5V, voltage type	12-Bit Precision
AI05	79	Analog Input 05	Analog Signal Input 0~5V, voltage type	12-Bit Precision
AI06	23	Analog Input 06	Analog Signal Input 0~5V, voltage type	12-Bit Precision
AI15	52	Analog Input 15	Analog Signal Input 0~5V, voltage type	12-Bit Precision
AI16	36	Analog Input 16	Analog Signal Input 0~5V, voltage type	12-Bit Precision
AI20	55	Analog Input 20	Analog Signal Input 0~5V, voltage type	12-Bit Precision
AI21	39	Analog Input 21	Analog Signal Input 0~5V, voltage type	12-Bit Precision
AI17	22	Analog Input 17	Analog Signal Input 0~32V	12-Bit Precision
AI18	53	Analog Input 18	Analog Signal Input 0~32V	12-Bit Precision
AI13	62	Analog Input 13	Analog Signal Input 0~32V	12-Bit Precision
AI14	40	Analog Input 14	Analog Signal Input 0~32V	12-Bit Precision
AI19	41	Analog Input 19	Analog Signal Input 0~32V	12-Bit Precision
AI22	54	Analog Input 22	Analog Signal Input 0~32V	12-Bit Precision
AI23	34	Analog Input 23	Analog Signal Input 0~32V	12-Bit Precision
AI24	61	Analog Input 24	Analog Signal Input 0~32V	12-Bit Precision
AI09	56	Analog Input 09	Analog Signal Input 0~5V, resistor type	12-Bit Precision
AI10	80	Analog Input 10	Analog Signal Input 0~5V, resistor type	12-Bit Precision
AI11	81	Analog Input 11	Analog Signal Input 0~5V, resistor type	12-Bit Precision
A12	78	Analog Input 12	Analog Signal Input 0~5V, resistor type	12-Bit Precision
Power-On Signal				
KEYON	59	Key Input Signal	Digital Signal Input 0~BATT	Active High
WAKE1	76	Wake-Up Signal	Digital Signal Input 0~BATT	Active High

WAKE2	44	Wake-Up Signal	Digital Signal Input 0~BATT	Active High
Digital Input				
DI01	20	Digital Input 01	Digital Signal Input 0~BATT	Active High
DI02	58	Digital Input 02	Digital Signal Input 0~BATT	Active High
DI03	77	Digital Input 03	Digital Signal Input 0~BATT	Active High
DI04	38	Digital Input 04	Digital Signal Input 0~BATT	Active High
DI07	15	Digital Input 07	Digital Signal Input 0~BATT	Active High
DI08	72	Digital Input 08	Digital Signal Input 0~BATT	Active High
DI09	21	Digital Input 09	Digital Signal Input 0~BATT	Active High
DI13	18	Digital Input 13	Digital Signal Input 0~BATT	Active Low
DI14	75	Digital Input 14	Digital Signal Input 0~BATT	Active Low
DI15	57	Digital Input 15	Digital Signal Input 0~BATT	Active Low
DI16	37	Digital Input 16	Digital Signal Input 0~BATT	Active Low
DI19	35	Digital Input 19	Digital Signal Input 0~BATT	Active Low
DI20	17	Digital Input 20	Digital Signal Input 0~BATT	Active Low
Frequency Input				
DI21/SPEED1	74	Frequency Input 1	Digital/Frequency Signal Input 0~BATT	Frequency Input / Active High
DI22/PEED2	16	Frequency Input 2	Digital/Frequency Signal Input 0~BATT	Frequency Input / Active High
DI23/SPEED3	73	Frequency Input 3	Digital/Frequency Signal Input 0~BATT	Frequency Input / Active Low
DI24SPEED4	19	Frequency Input 4	Digital/Frequency Signal Input 0~BATT	Frequency Input / Active Low
Output Signal				
HS01	88	High-Side Output 01	Rated 1A, Peak 3A	Can be configured as PWM output
HS02	89	High-Side Output 02	Rated 1A, Peak 3A	Can be configured as PWM output
HS03	97	High-Side Output 03	Rated 1A, Peak 3A	
HS04	96	High-Side Output 04	Rated 0.5A, Peak 1A	
HS09	115	High-Side Output 09	Rated 3A, Peak 5A	
HS10	114	High-Side Output 10	Rated 3A, Peak 5A	
HS05	104	High-Side Output 05	Rated 0.5A, Peak 1A	
HS06	105	High-Side Output 06	Rated 0.5A, Peak 1A	
HS07	113	High-Side Output 07	Rated 1A, Peak 3A	
HS08	112	High-Side Output 08	Rated 1A, Peak 3A	
LS11	91	Low-Side Output 11	Rated 0.5A, Peak 1A	
LS10	102	Low-Side Output 10	Rated 0.5A, Peak 1A	
LS07	109	Low-Side Output 07	Rated 0.5A, Peak 1A	
LS08	107	Low-Side Output 08	Rated 0.5A, Peak 1A	
LS05	110	Low-Side Output 05	Rated 0.5A, Peak 1A	
LS06	103	Low-Side Output 06	Rated 0.5A, Peak 1A	

LS09	100	Low-Side Output 09	Rated 0.5A, Peak 1A	
LS13	111	Low-Side Output 13	Rated 1A, Peak 3A	
LS12	93	Low-Side Output 12	Rated 1A, Peak 3A	
LS15	108	Low-Side Output 15	Rated 1A, Peak 3A	
LS14	95	Low-Side Output 14	Rated 1A, Peak 3A	
LS16	99	Low-Side Output 16	Rated 1A, Peak 3A	
LS17	98	Low-Side Output 17	Rated 1A, Peak 3A	
LS18	106	Low-Side Output 18	Rated 1A, Peak 3A	
LS01	101	Low-Side Output 01	Rated 3A, Peak 5A	Can be configured as PWM output
LS02	94	Low-Side Output 02	Rated 3A, Peak 5A	Can be configured as PWM output
LS03	90	Low-Side Output 03	Rated 3A, Peak 5A	Can be configured as PWM output
LS04	92	Low-Side Output 04	Rated 3A, Peak 5A	Can be configured as PWM output
Serial Communication Interface				
CANA_H	31	CANA_H	Include 120Ohm Terminal Resistance	Supports ISO11898/CAN-FD and CAN flashing
CANA_L	32	CANA_L		
CANB_H	11	CANB_H	Include 120Ohm Terminal Resistance	Supports ISO11898/CAN-FD and CAN flashing
CANB_L	12	CANB_L		
CANC_H	29	CANC_H	Include 120Ohm Terminal Resistance	Supports ISO11898/CAN-FD and CAN flashing
CANC_L	30	CANC_L		
CAND_H	13	CAND_H	Include 120Ohm Terminal Resistance	Supports ISO11898/CAN-FD and CAN flashing
CAND_L	14	CAND_L		
CANE_H	27	CANE_H	Exclude 120Ohm Terminal Resistance	Supports CAN specific frame wake-up
CANE_L	28	CANE_L		
CANF_H	9	CANF_H	Exclude 120Ohm Terminal Resistance	Supports CAN specific frame wake-up
CANF_L	10	CANF_L		
CAN_SHILD1	46	CAN Shielded Wire		
CAN_SHILD2	8	CAN Shielded wire		
LIN1	7	LIN BUS1		
LIN3	26	LIN BUS3		
MCU_MDI_N	49	Ethernet Port		Supports Wake-up function
MCU_MDI_P	68			
Internal Signal				
AI28	--	Acquire power supply voltage BATT	--	12-Bit Precision

2.2 Pin Description

2.2.1 Analog Signal Input

Description

The analog input channel circuits have the same structures, including EMC capacitors, pull-up/pull-down resistors, and first-order low-pass filter circuit.

Main difference:

- Resistance value of pull-up/pull-down resistor
- Pull-up voltage
- Filter's Time-constant

Schematic

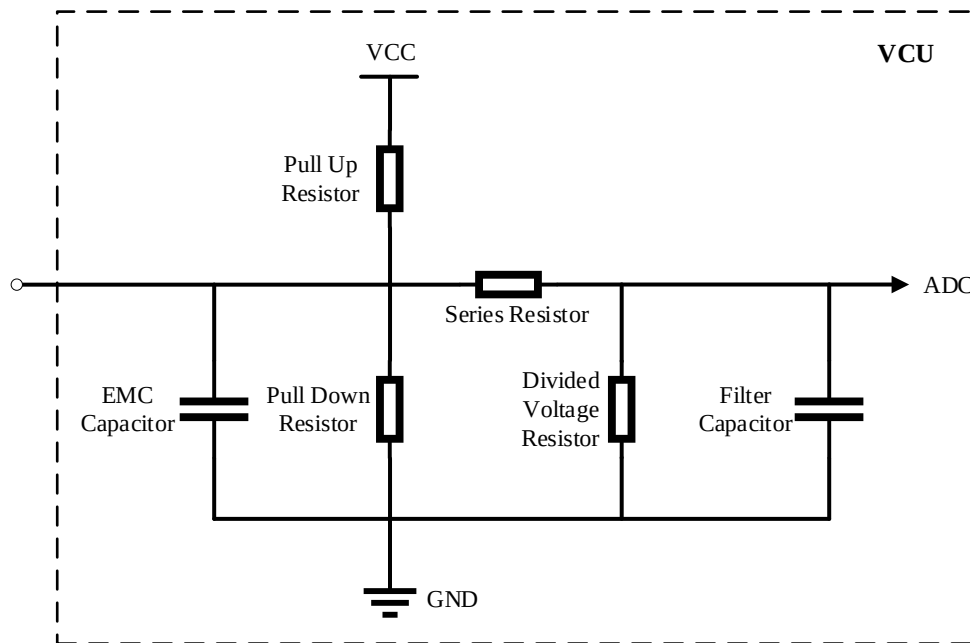


Figure 4 Schematic of Analog Signal Input Channel

Table 2.2.1.1 Analog Signal Input Channel Parameter

AI#	EMC Capacitor	Pull Up Resistor		Pull down Resistor	Series Resistor	Divided Voltage Resistor	Filter Capacitor	Operation Range		Input Range		Conditions / Remarks
	(F)	to U _B (Ohm)	to 5V (Ohm)	to GND (Ohm)	(Ohm)	(Ohm)	(F)	V _{low}	V _{high}	Min	Max	
AI01	100n	--	--	--	22k	--	1n	0V	5V	0V	5V	
AI02	100n	--	--	--	22k	--	1n	0V	5V	0V	5V	
AI03	100n	--	--	--	22k	--	1n	0V	5V	0V	5V	
AI04	100n	--	--	--	22k	--	1n	0V	5V	0V	5V	
AI05	100n	--	--	--	22k	--	1n	0V	5V	0V	5V	
AI06	100n	--	--	--	22k	--	1n	0V	5V	0V	5V	
AI15	100n	--	--	--	22k	--	1n	0V	5V	0V	5V	

AI16	100n	--	--	--	22k	--	1n	0V	5V	0V	5V	
AI20	100n	--	--	--	22k	--	1n	0V	5V	0V	5V	
AI21	100n	--	--	--	22k	--	1n	0V	5V	0V	5V	
AI09	100n	--	10k	--	22k	--	1n	0V	5V	0V	5V	
AI10	100n	--	10k	--	22k	--	1n	0V	5V	0V	5V	
AI11	100n	--	10k	--	22k	--	1n	0V	5V	0V	5V	
AI12	100n	--	10k	--	22k	--	1n	0V	5V	0V	5V	
AI13	100n	--	--	--	22k	3.48k	1n	0V	32V	0V	32V	
AI14	100n	--	--	--	22k	3.48k	1n	0V	32V	0V	32V	
AI17	100n	--	--	--	22k	3.48k	1n	0V	32V	0V	32V	
AI18	100n	--	--	--	22k	3.48k	1n	0V	32V	0V	32V	
AI19	100n	--	--	--	22k	3.48k	1n	0V	32V	0V	32V	
AI22	100n	--	--	--	22k	3.48k	1n	0V	32V	0V	32V	
AI23	100n	--	--	--	22k	3.48k	1n	0V	32V	0V	32V	
AI24	100n	--	--	--	22k	3.48k	1n	0V	32V	0V	32V	
AI28	100n	--	--	--	22k	3.48k	1n	0V	32V	0V	32V	

Note:

- 1) "--" denotes Not installed.
- 2) U_B denotes BATT voltage.
- 3) AI28 collects BATT voltage.
- 4) KEYON is only used for key signal.

2.2.2 Digital Signal Input

Description

The digital input channel circuits have the same structures, including EMC capacitors, pull-up/pull-down resistors, voltage divider resistors, and a first-order low-pass filter.

Main difference:

- Resistance of pull-up/pull-down resistor
- Selection of pull up/down resistor
- Filter's Time-constant

Schematic

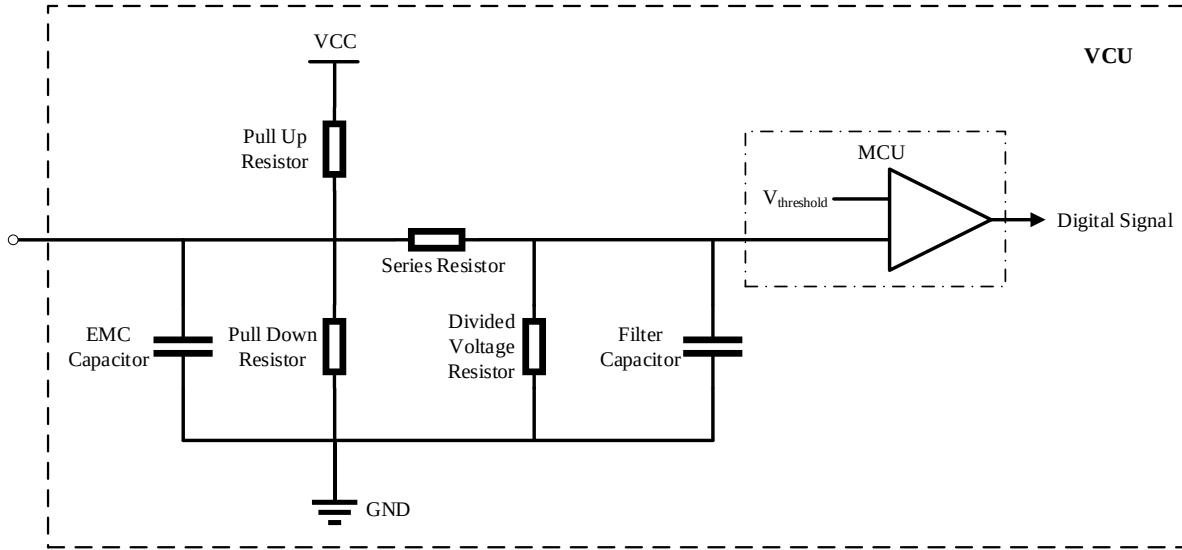


Figure 5 Schematic of Digital Signal Input Channel

Table 2.2.2.1 Digital Signal Input Channel Parameter

DI#	EMC Capacitor	Filter Capacitor	Pull Up Resistor		Pull Down Resistor	Series Resistor	Divided Voltage Resistor	Operation Threshold for Input Signal		Input Range		Conditions/Remarks
	(F)	(F)	to U_B (Ohm)	to 5V(Ohm)	(Ohm)	(Ohm)	(Ohm)	V_{low}	V_{high}	Min	Max	
DI01	10n	100p	--	--	10k	100k	33k	5V	8.5V	0V	U_B	
DI02	10n	100p	--	--	10k	100k	33k	5V	8.5V	0V	U_B	
DI03	10n	100p	--	--	10k	100k	33k	5V	8.5V	0V	U_B	
DI04	10n	100p	--	--	10k	100k	33k	5V	8.5V	0V	U_B	
DI07	10n	100p	--	--	10k	100k	33k	5V	8.5V	0V	U_B	
DI08	10n	100p	--	--	10k	100k	33k	5V	8.5V	0V	U_B	
DI09	10n	100p	--	--	10k	100k	33k	5V	8.5V	0V	U_B	
DI13	10n	100p	10k	--	--	100k	51k	5V	8.5V	0V	U_B	
DI14	10n	100p	10k	--	--	100k	51k	5V	8.5V	0V	U_B	
DI15	10n	100p	10k	--	--	100k	51k	5V	8.5V	0V	U_B	
DI16	10n	100p	10k	--	--	100k	51k	5V	8.5V	0V	U_B	
DI19	10n	100p	10k	--	--	100k	51k	5V	8.5V	0V	U_B	
DI20	10n	100p	10k	--	--	100k	51k	5V	8.5V	0V	U_B	
WAKE1	10n	100p	--	--	10k	100k	33k	5V	8.5V	0V	U_B	Wake-up Signal
WAKE2	10n	100p	--	--	10k	100k	33k	5V	8.5V	0V	U_B	Wake-up Signal

Note:

- 1) "--" denotes Not installed.
- 2) U_B denotes BATT voltage.
- 3) WAKE1 and WAKE2 are used for hardwire wake-up signal only.

2.2.3 Frequency Signal Input

Description

The frequency input channel circuits have similar structures, including EMC capacitors, pull-up/pull-down resistors, voltage divider resistors and a first-order low-pass filter circuit.

Main difference:

- Resistance of pull-up/pull-down resistor

- Pull-up or pull-down
- Filter's Time-constant

Schematic

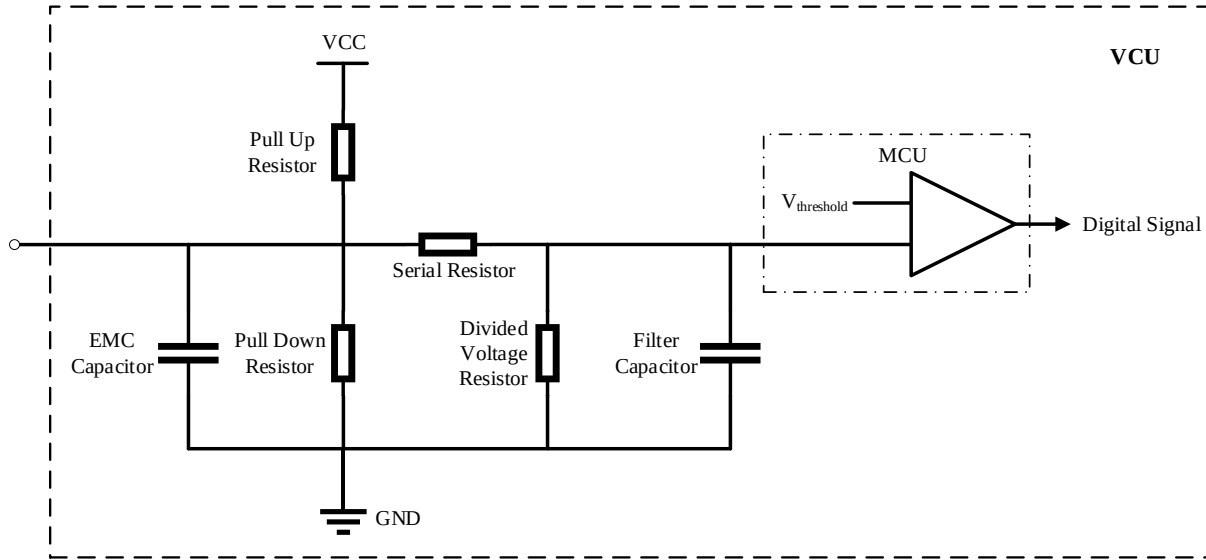


Figure 6 Schematic Diagram of Frequency Signal Input Channel

Table 2.2.3.1 Frequency Signal Input Channel Parameter

SPEED#	EMC Capacitor	Filter Capacitor	Pull Up Resistor		Pull Down Resistor	Series Resistor	Divided Voltage Resistor	Operation Threshold for Input Signal		Input Range	
	(F)	(F)	to U_B (Ohm)	to 5V(Ohm)	(Ohm)	(Ohm)	(Ohm)	V_{low}	V_{high}	Min	Max
SPEED1	10n	100p	--	--	10k	100k	33k	5V	8.5V	0V	UB
SPEED2	10n	100p	--	--	10k	100k	33k	5V	8.5V	0V	UB
SPEED3	10n	100p	10k	--	--	100k	51k	5V	8.5V	0V	UB
SPEED4	10n	100p	10k	--	--	100k	51k	5V	8.5V	0V	UB

Note:

- 1) "--" denotes Not installed.
- 2) U_B denotes BATT voltage.
- 3) Frequency inputs, SPEED1, SPEED2, SPEED3 and SPEED 4 can be configured as Digital inputs, DI21, DI22, DI23, DI24.
- 4) The frequency and duty cycle reference values of the frequency signal input channel are shown in the following table (test conditions: BATT=12V, pulse input amplitude=10V, pulse input offset=5V),

Table 2.2.3.2 Frequency Signal Input Channel Frequency and Duty Cycle Reference Value

Input Frequency	Detected Frequency	Input Duty Cycle	Detected Duty Cycle	Input Duty Cycle	Detected Duty Cycle	Input Duty Cycle	Detected Duty Cycle
100Hz	100Hz	10.0%	9.91%	50.0%	49.96%	90.0%	89.90%
1000Hz	1000Hz	10.0%	9.52%	50.0%	49.60%	90.0%	89.52%
2000Hz	2000Hz	10.0%	9.12%	50.0%	49.12%	90.0%	89.12 %

2.2.4 Low-side Driver

Description

The low-side driver is a switch for driving peripheral devices controlled by SPI or GPIO signals. All low-side drive channels have a fault diagnosis function.

Main difference:

- Current value
- PWM Capability

Schematic

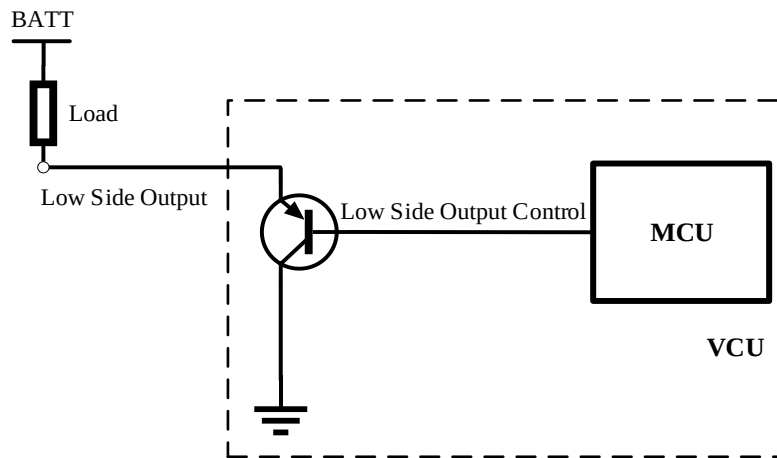


Figure 7 Schematic Diagram of Low-Side Driver Channel

Table 2.2.4.1 Low-Side Driver Channel Parameter

LS#	EMC Capacitor	Output Current	Conditions / Remarks
	(F)	Max	
LS01	100p	3A	OPWM Configurable
LS02	100p	3A	OPWM Configurable
LS03	100p	3A	OPWM Configurable
LS04	100p	3A	OPWM Configurable
LS05	--	1A	
LS06	--	1A	
LS07	--	1A	
LS08	--	1A	
LS09	--	1A	
LS10	--	1A	
LS11	--	1A	
LS12	--	1A	
LS13	--	1A	
LS14	--	1A	
LS15		1A	
LS16		1A	
LS17		1A	
LS18		1A	

Note:

1. "--" denotes Not installed
2. Please refer to the **Power Control Output** section in EcoCoder manual, before using any low-side drivers.
3. The total load of all low-side driver channels should not exceed 5A.

Table 2.2.4.2 Fault diagnosis of low-side driver

Low-Side Driver Channel	Fault	
	Disable	Enable
LSO01, LSO02, LSO03, LSO04, LSO06, LSO07, LSO08, LSO09, LSO10, LSO11, LSO12, LSO13, LSO14, LSO15, LSO16, LSO17, LSO18	•No load •Short to ground	•Short to power

Note:

- 1) Please refer to EcoCoder manual for the usage of **Diagnostic Blocks**.
- 2) All low-side driver channels have short-circuited protection. When it is enabled, if a channel is short-circuited to the ground, it will automatically activate the short-circuit protection function. This function may cause the channel to have a fault code jump phenomenon in this case, which is normal.
- 3) When LSO01-04 are configured as OPWM, the reference values of frequency and duty cycle are shown in the following table (test conditions: BATT = 12V, load = 24 Ohm, duty cycle is all calculated as positive duty cycle).

Table 2.2.4.3 LS OPWM Frequency and Duty Cycle Reference Value

Set Frequency	Output Frequency	Set Duty Cycle	Output Duty Cycle	Set Duty Cycle	Output Duty Cycle	Set Duty Cycle	Output Duty Cycle
100Hz	100Hz	10.0%	9.6%	50.0%	49.6%	90.0%	89.6%
1000Hz	1000Hz	10.0%	10.4%	50.0%	50.4%	90.0%	90.4%
2000Hz	2000Hz	10.0%	10.8%	50.0%	50.6%	90.0%	90.8%

2.2.5 High-side Driver

Description

Controlled by GPIO, the high-side driver can be used as a switch for driving peripheral devices. All high-side driver channels have a fault diagnosis function.

Main difference:

- Current value
- PWM Capability

Schematic

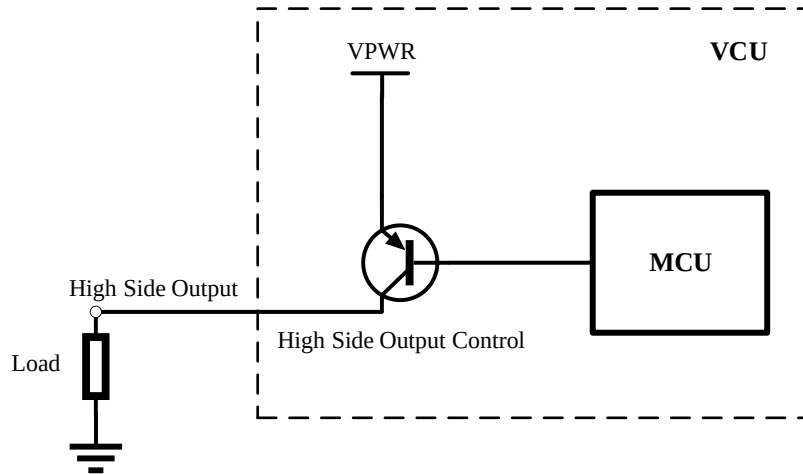


Figure 8 Schematic Diagram of High-Side Driver Channel

Table 2.2.5.1 High-Side Driver Channel Parameter

HS #	EMC Capacitor	Output current	Conditions / Remarks
	(F)	Max (A)	
HS01	10n	3	OPWM Configurable
HS02	10n	3	OPWM Configurable
HS03	10n	3	
HS04	10n	1	
HS05	10n	1	
HS06	10n	1	
HS07	10n	3	
HS08	10n	3	
HS09	10n	5	
HS10	10n	5	

Note:

- Before using any high-side channels, please set **PWR12V_DRVP** as **1**, according to the instruction of EcoCoder manual **Power Control Output** block section.
- The total load of all high-side driver channels should not exceed 5A.**

Table 2.2.5.2 Fault Diagnosis of High-side Driver

High-side driver channel	Fault	
	Disable	Enable
HSO01, HSO02, HSO03, HSO04, HSO05, HSO06, HSO07, HSO08, HSO09, HSO10	•Short to power supply	•No load •Short to ground •Short to power

Note:

- Please refer to EcoCoder manual for the usage of the **Diagnostic Blocks**.

2) When HS01 and HS02 are configured as OPWM, the reference values of frequency and duty cycle are shown in the following table (test conditions: BATT = 12V, load = 24 Ohm, duty cycle is all calculated as positive duty cycle).

Table 2.2.5.3 HS OPWM Frequency and Duty Cycle Reference Value

Preset Frequency	Output Frequency	Preset Duty Cycle	Output Duty Cycle	Preset Duty Cycle	Output Duty Cycle	Preset Duty Cycle	Output Duty Cycle
100Hz	100Hz	10.0%	10.4%	50.0%	50.4%	90.0%	90.4%
1000Hz	1000Hz	10.0%	11.2%	50.0%	51.2%	90.0%	91.2%
2000Hz	2000Hz	10.0%	11.2%	50.0%	52.8%	90.0%	92.8%

2.2.6 CAN Bus

Description

CAN interface is used for communication between VCU and other vehicle electronic controllers. All 6 channels CAN Bus support CANFD.

CANA, CANB also support specific frame wake-up function.

Schematic

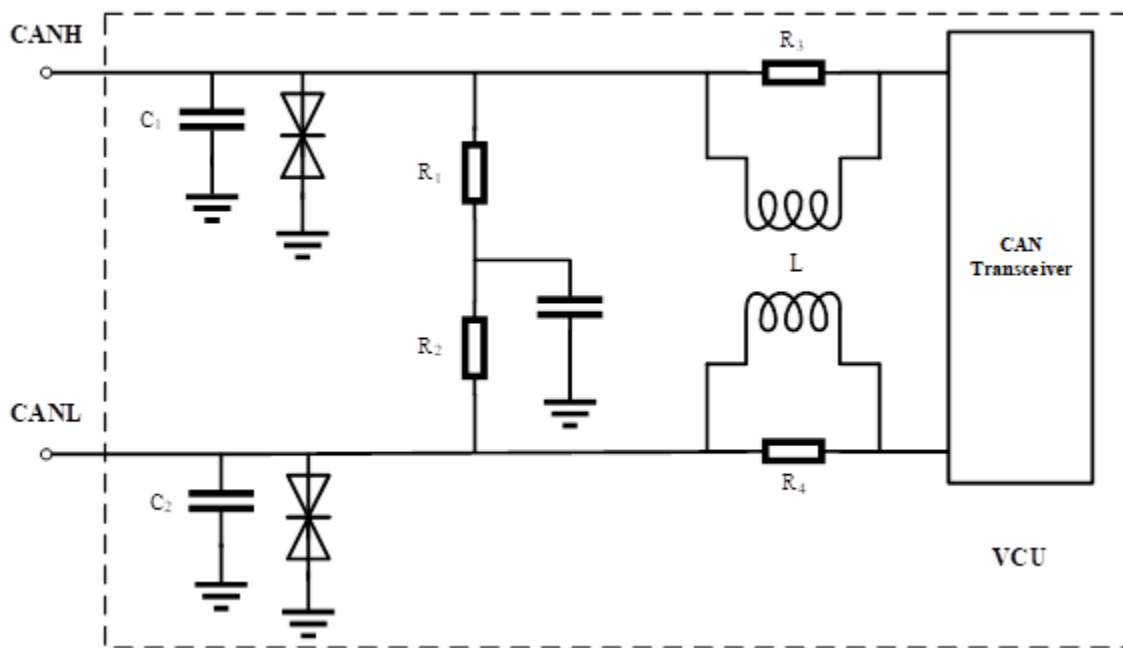


Figure 9 CAN Bus Schematic

Table 2.2.6.1 CAN Bus interface

CAN #	EMC Capacitor C ₁ , C ₂ (F)	R ₁ , R ₂ (Ohm)	Choke L	Conditions / Remarks
CANA H	47p	60	Yes	Support ISO 11898/CANFD, support CAN flashing
CANA L	47p	60		
CANB H	47p	60	Yes	Support ISO 11898/CANFD, support CAN flashing
CANB L	47p	60		
CANC H	47p	60	Yes	Support ISO 11898/CANFD,

CANC L	47p	60	Yes	support CAN flashing
CAND H	47p	60		Support ISO 11898/CANFD, support CAN flashing
CAND L	47p	60		
CANE H	47p	--	Yes	Support CAN specific frame wake-up
CANE L	47p	--		
CANF H	47p	--	Yes	Support CAN specific frame wake-up
CANF L	47p	--		

2.2.7 LIN Bus

Description

LIN (Local Interconnect Network) bus supports master/slave node communication mode, with short-to-power protection feature.

Schematic

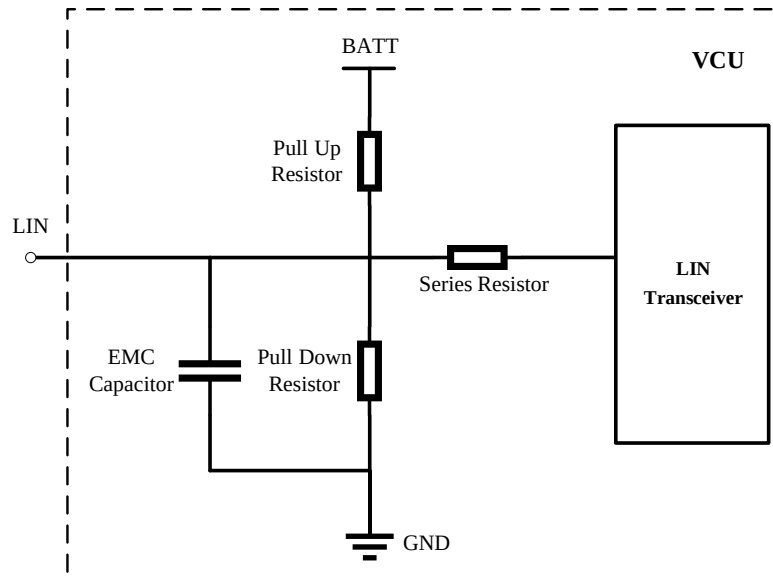


Figure 10 LIN Bus Schematic

Table 2.2.7.1 LIN Bus Parameter

LIN #	EMC Capacitor	Pull Up Resistor	Pull Down Resistor	Series Resistor	Conditions / Remarks
	(F)	to U_B (Ohm)	to GND (Ohm)	(Ohm)	
LIN1	1n	1k	--	--	
LIN3	1n	1k	--	--	

2.2.8 5V Output

Description

The 5V voltage output channel can provide 5V power supply for external sensors and has the following functions:

- Accurate 5V output for internal IC power supply
- 6 Channels of sensor 5V power supply output
- Invert connection protection, short circuit protection, over-temperature protection

Table 2.2.8.1 5V Sensor Power Output Parameter

Supply Voltage #	I _{max} (mA)	Output Voltage
5V supply voltage 1	150	5V±2%
5V supply voltage 2	150	5V±2%
5V supply voltage 3	250	5V±2%
5V supply voltage 4	250	5V±2%
5V supply voltage 5	250	5V±2%
5V supply voltage 6	250	5V±2%

Note: All 5V output channels should be configured by EcoCoder **Power Control Output** block. Please refer to the examples PWR5V3, PWR5V4, PWR5V5 and PWRV6 in the Power Control Output section in EcoCoder manual.

2.2.9 8V Output

Description

The 8V voltage output channel provides an 8V supply voltage to the external wheel speed sensor, with the following functions:

- Provide power for external wheel speed sensor
- 4 Channels of sensor 8V power supply output
- Short circuit protection, over-temperature protection

Table 2.2.9.1 8V Sensor Power Output Parameter

Supply Voltage #	I _{max} (mA)	Output Voltage
8V supply voltage 1	Total current will not exceed 500 mA	8V±2%
8V supply voltage 2		8V±2%
8V supply voltage 3		8V±2%
8V supply voltage 4		8V±2%

Note: The 8V output channel needs to be turned on through EcoCoder Power Control Output block.

Please refer to Power Control Output chapter in EcoCoder manual, for PWR8V1 application layer model configurations.

2.2.10 Automotive Ethernet

Description

Automotive Ethernet TJA1101 is a 100BASE-T1 standard Ethernet PHY, which is optimized for automotive use cases such as gateways, IP camera links, driver assistance systems, and backbone networks.

Schematic

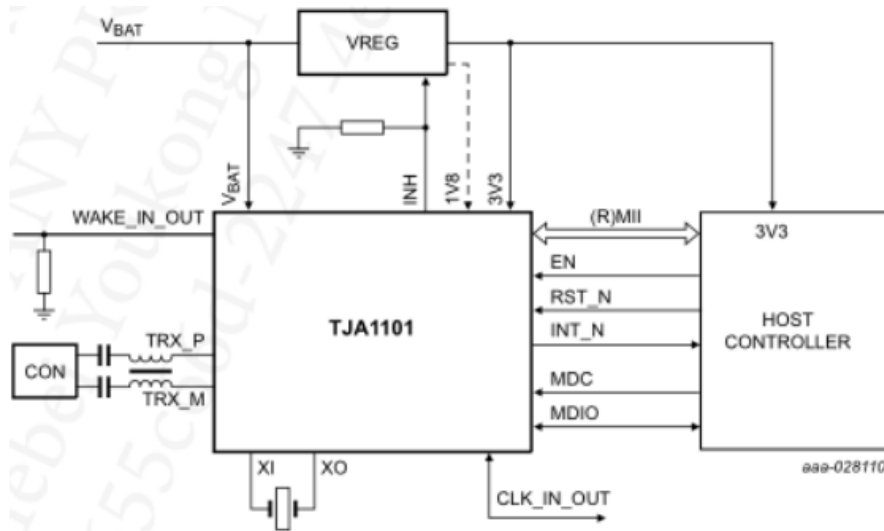


Figure 11 Automotive Ethernet Schematic

Table 2.2.10.1 Automotive Ethernet Parameter

Automotive Ethernet	Capacitance	Common mode inductance	ESD	Speed
MCU_MDI_P	100nF	ACT1210L-101-2P-TL00	PWSD2ETH-X	100 Mbit/s
MCU_MDI_N				

Chapter 3 Technical Performance

3.1 Electrical Characteristics

Item	Design Specifications
Operating Voltage	DC 12 V / 24V (9~32V)
Operating Temperature	-40 °C ~85 °C
Working Humidity	0~95%, No Condensation
Storage Temperature	-40 °C ~85 °C
Quiescent Current	<1mA
Rated Power Consumption	3 W (No Load)
Protection Level	IP67
Weight	≤ 700g
Controller Size	207×150×42mm
Material	Die-Cast Aluminum
Housing	Equipped With Waterproof Breathable Valve, Good Heat Dissipation

3.2 Electrical Performance Standard

Item	Test Standard
Direct Current Supply Voltage	ISO 16750-2
Overvoltage (12V, High Temperature)	ISO 16750-2
Slow Decrease and Increase of Supply Voltage	ISO 16750-2
Superimposed Alternating Voltage	ISO 16750-2
Reversed Voltage	ISO 16750-2
Low Voltage Reset Features	ISO 16750-2
Low Voltage Start Features	ISO 16750-2
Open Circuit Tests – Single Line Interruption	ISO 16750-2
Open Circuit Tests – Multiple Line Interruption	ISO 16750-2
Short Circuit Protection	ISO 16750-2
Withstand Voltage	ISO 16750-2
Insulation Resistance	ISO 16750-2

3.3 Environmental Standards

Item	Test Standard
Waterproof (IP67)	IEC/EN 60529
Dustproof (IP67)	ISO 20653
Salt Spray Leakage Function and Corrosion Test	ISO 16750-4
Mechanical Shock Test	ISO 16750-3
Vibration Test	ISO 16750-3
Drop Test	ISO 16750-3
Temperature Shock	ISO 16750- 4
Electrical Operation at Circulating Ambient Temperature	ISO 16750-4
High and Low Temperature Operation Experiment	ISO 16750-4
High and Low Temperature Experiment	ISO 16750-4
Temperature and Humidity Cycle	IEC 60068-2-30
Constant Temperature and Humidity	ISO 16750-4

3.4 EMC Test Standard

Item	Test Standard
Voltage Transient Emissions Test	ISO7637-2
Conducted Emission (CE-V)	CISPR25
Conducted Emission (CE-C)	CISPR25
Radiation Emission (RE-ALSE)	CISPR25
Radiation Immunity Experiment (I/O)-ICC	ISO7637-3
Radiation Immunity Experiment BCI-Substitution Method	ISO11452-4
Radiation Immunity Experiment (RI)	ISO11452-2
Low Frequency Magnetic Field Immunity	ISO11452-8
ESD	ISO 10605

Chapter 4 Installation Requirements

It is recommended to install the VCU in the cockpit. If the OEM wants to assemble the VCU in another location, the corresponding installation location should be evaluated by engineers from both Ecotron and the OEM.

The precautions for VCU installation are as follows:

1. The VCU and wiring harness installation should be firm and reliable, and there should be no looseness. Avoid supporting the wiring harness by VCU. At the same time, the arrangement of the VCU wiring harness should prevent and protect all wires in the wiring harness from damage due to wear and to overheat.
2. Try to avoid installing in places where dust is easy to gather. A large amount of dust accumulation will affect the reliability of VCU work.
3. VCU should keep away from the location where the temperature of the housing itself may exceed 85°C. At the same time, it is necessary to prevent the surrounding parts from releasing heat to the VCU.
4. Avoid installing the VCU in locations where oil, moisture, and water droplets are likely to splash on it.
5. Avoid the possibility of additional mechanical shock and external impact due to the installation position and fixing method of the VCU and avoid installing the VCU at the resonance point of the car body.
6. Avoid installing the VCU where it may come into contact with the battery or other parts that are prone to seepage of acid and alkaline solutions and near the VCU power terminal.
7. VCU should be installed in the horizontal and vertical position according to the connector downwards and maintain a certain angle to prevent water from entering the connector. In the horizontal direction, the recommended installation angle is -170° to -10° , as shown in Figure 13 below. In the vertical direction, the recommended installation angle is -170° ~ -10° , as shown in Figure 14 below.

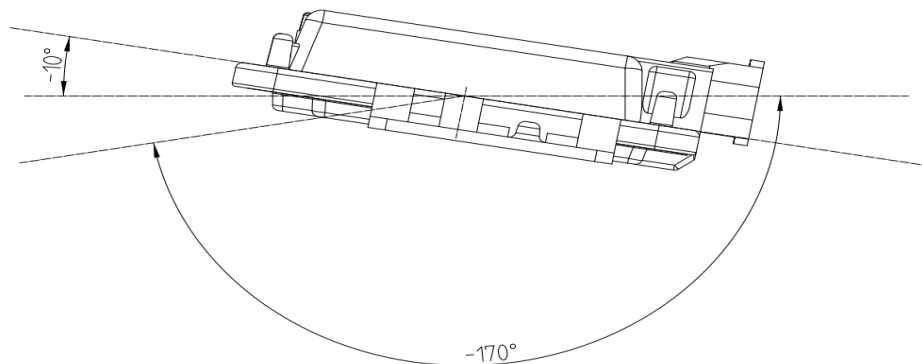


Figure 11 Horizontal Installation Angle

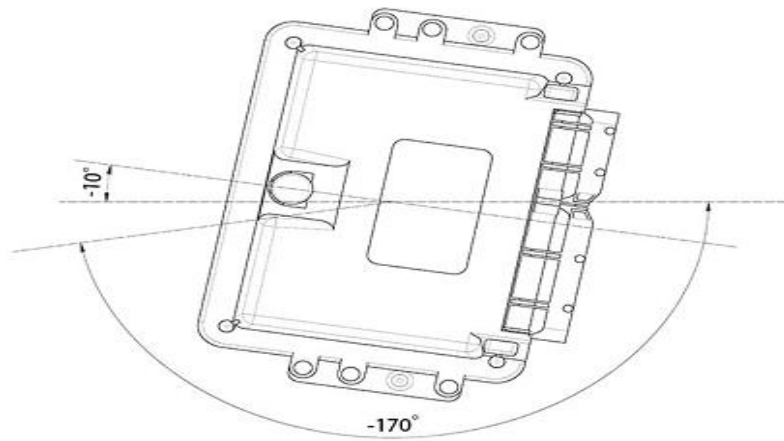
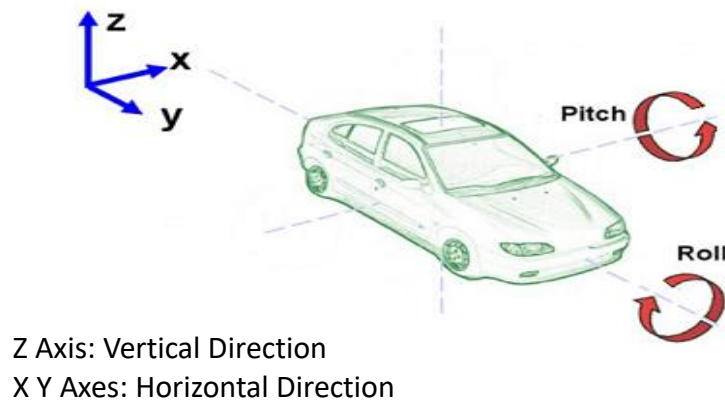


Figure 12 Vertical Installation Angle

Ecotron recommends using the six installation points on the VCU for installation and fixation. It is recommended to use metal materials such as aluminum alloy for the mounting bracket. The housing should have a reliable electrical connection with the vehicle body through the bracket. If other materials are used, the customer must ensure that they can meet the requirements of VCU for vibration, heat dissipation, temperature, EMC, etc. If there is any deviation, it needs to be confirmed with Ecotron.

The VCU system adopts Ground through the vehicle's body. The specific requirement is to directly connect the ground wire in the wiring harness to the vehicle's body and ensure reliable electrical connections.

Table 4.1 Recommended Mounting Components and Specifications:

Item	Comment
25 mm M6 Bolt	Installed with a torque of 7N*M
M6 Nut	
Buffer Ring	6 mm Inner Diameter, 20 Outer diameter and 15 mm thickness.