

OBD-DEV — DATASHEET

ESP32-based OBD-II / CAN development interface · Preliminary, Rev. 0.3

1. OVERVIEW

OBD-DEV is a compact OBD-II and CAN development interface built around an Espressif ESP32-WROVER module. Plug it into the vehicle's 16-pin OBD-II port and get direct access to the high-speed CAN bus over USB or Bluetooth – no adapters, no extra wiring.

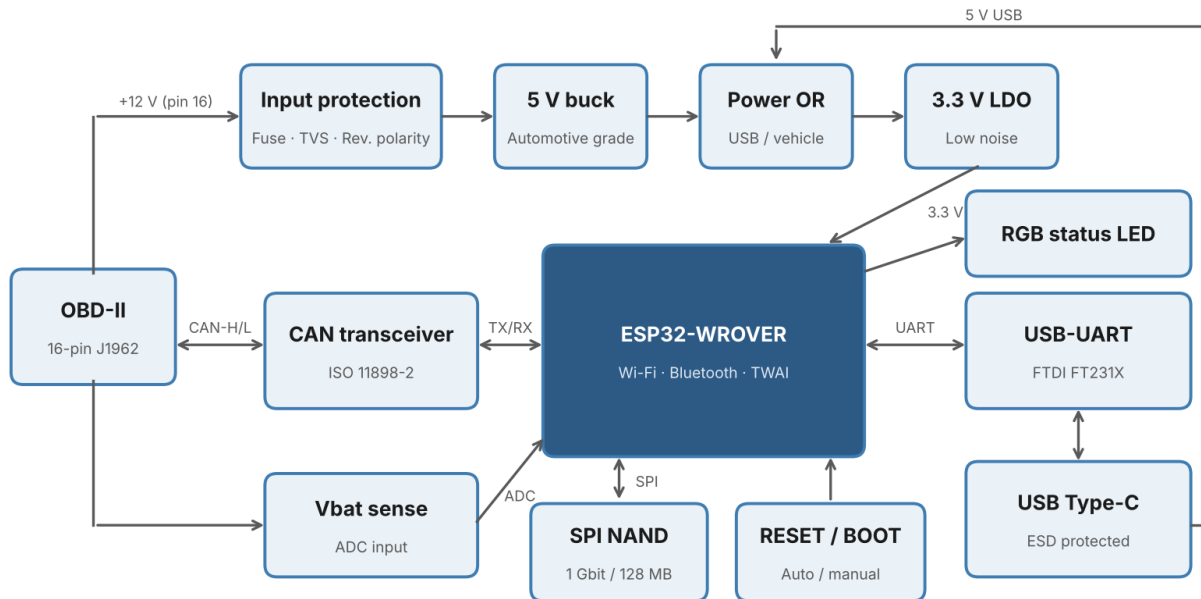
One device covers the whole journey: start with basic OBD-II diagnostics, then use the same hardware for CAN logging, reverse engineering and your own automotive firmware. A fully protected automotive power input, a listen-only CAN mode and 128 MB of onboard storage make it a dependable tool on the bench and in the car.

The hardware is based on the open-source Macchina A0 design and runs Macchina A0 firmware, so existing tools such as SavvyCAN, Torque can be used out of the box. Developers can also write their own firmware with the standard ESP32 toolchains.

2. KEY FEATURES

- ESP32-WROVER module: dual-core MCU, Wi-Fi 802.11 b/g/n and Bluetooth (Classic + BLE), integrated PCB antenna
- One high-speed CAN channel (CAN 2.0A/B, up to 1 Mbit/s) on OBD-II pins 6/14
- Hardware listen-only (silent) mode for passive, non-intrusive bus sniffing
- 1 Gbit (128 MB) onboard SPI NAND flash for data logging
- USB Type-C with FTDI FT231X USB-UART bridge and ESD protection
- Protected automotive power input: overcurrent, transient and reverse-polarity protection
- Powered from the vehicle or from USB alone – program and test on the bench without a car
- Onboard vehicle supply-voltage measurement
- RESET and BOOT buttons plus AUTO/MANUAL switch for the auto-programming circuit
- Addressable RGB status LED with software-controlled power switch
- Compact: 67 × 47 × 22 mm, 40 g
- Compatible with Macchina A0 firmware and SavvyCAN

3. BLOCK DIAGRAM



4. SPECIFICATIONS

PROCESSOR AND MEMORY

MCU module	Espressif ESP32-WROVER-E
CPU	Dual-core Xtensa LX6, up to 240 MHz
Data storage	1 Gbit (128 MB) SPI NAND flash
Wi-Fi	IEEE 802.11 b/g/n, 2.4 GHz
Bluetooth	Bluetooth Classic (BR/EDR) and Bluetooth Low Energy
Antenna	Integrated PCB antenna

VEHICLE INTERFACE

Connector	OBD-II (SAE J1962) 16-pin plug, right-angle
CAN channels	1 × high-speed CAN (OBD-II pins 6 and 14)
CAN controller	ESP32 TWAI, CAN 2.0A (11-bit) and 2.0B (29-bit), up to 1 Mbit/s
CAN transceiver	High-speed CAN transceiver, ISO 11898-2
Operating modes	Normal and silent (listen-only), selected by GPIO
OBD-II protocols	ISO 15765-4 (CAN). K-Line (ISO 9141-2 / ISO 14230) and SAE J1850 are not supported.
Bus termination	None on board (provided by the vehicle). Add 120 Ω for bench use.
CAN protection	ESD protection and EMI filtering on CAN-H / CAN-L

USB INTERFACE

Connector	USB Type-C receptacle
USB standard	USB 2.0 Full Speed
USB-UART bridge	FTDI FT231X (FTDI VCP driver)
ESD protection	ESD protection on D+ / D-
Programming	Automatic via DTR/RTS, or manual with BOOT/RESET buttons

POWER SUPPLY

Supply sources	Vehicle battery via OBD-II pin 16, or USB (5 V). Either source can power the complete device.
Nominal input voltage	12 V vehicle systems
Input voltage range	6-36 V
Input protection	Resettable overcurrent fuse, transient voltage suppression, low-loss reverse-polarity protection
Power conversion	Automotive-grade 5 V synchronous buck converter, low-noise 3.3 V LDO
Voltage monitoring	Vehicle supply voltage measured by ESP32 ADC1 (GPIO35)

CONTROLS AND INDICATORS

Buttons	RESET (EN) and BOOT (GPIO0), IP67 tactile switches
Switch	AUTO / MANUAL slide switch – connects or disconnects the DTR/RTS auto-programming circuit
Status LED	Addressable RGB LED, power switched by GPIO

MECHANICAL

Dimensions	67 × 47 × 22 mm
Weight	40 g
Enclosure	PA12-HP NYLON

5. OBD-II CONNECTOR PINOUT

Pin	Signal	Note
4	Chassis ground	Connected to signal ground via RC network
5	Signal ground	Main ground reference
6	CAN-H	High-speed CAN (ISO 15765-4)
14	CAN-L	High-speed CAN (ISO 15765-4)
16	Battery +12 V	Main supply input
All others	Not connected	—

6. ESP32 PIN ASSIGNMENT

ESP32 pin	Function	Note
GPIO5	CAN TX	To CAN transceiver
GPIO4	CAN RX	From CAN transceiver
GPIO21	CAN silent mode	Low = normal, high = listen-only
GPIO32	NAND flash /CS	SPI NAND
GPIO18	NAND flash CLK	SPI NAND
GPIO23	NAND flash DI	SPI NAND
GPIO19	NAND flash DO	SPI NAND
GPIO35	Supply voltage sense	ADC1, input only
GPIO2	RGB LED data	Addressable LED data input
GPIO13	RGB LED power	Low = LED on
GPIO1 / GPIO3	UART0 TX / RX	FT231X USB-UART
GPIO0	BOOT	Boot-mode strapping, BOOT button
EN	RESET	Chip enable, RESET button

7. PROGRAMMING MODES

- **AUTO:** the FT231X DTR/RTS lines control EN and GPIO0 automatically. Firmware can be uploaded without pressing any buttons.
- **MANUAL:** the auto circuit is disconnected. Use when a PC, driver or terminal program resets the board unintentionally. To enter download mode, hold BOOT, press and release RESET, then release BOOT.

8. SOFTWARE COMPATIBILITY

- Macchina A0 firmware
- SavvyCAN – CAN capture, analysis and reverse engineering (with Macchina A0 firmware)
- Custom firmware: Arduino-ESP32 and ESP-IDF

10. INTENDED USE AND SAFETY INFORMATION

DEVELOPMENT AND DIAGNOSTIC TOOL. OBD-DEV is intended for vehicle diagnostics, CAN bus analysis, research and development by users with appropriate technical knowledge. It is not type-approved and is not designed, tested or certified as a permanently installed vehicle component.

By installing or using this product, you acknowledge and agree to the following:

- Transmitting messages on a vehicle's CAN bus can change the behaviour of vehicle systems, including safety-related systems. Do not transmit CAN messages while the vehicle is being driven on public roads.
- Use listen-only (silent) mode whenever you only need to observe bus traffic.
- Do not leave the device connected to an unattended vehicle for long periods, as it draws current from the vehicle battery.
- StroMech Electronics and its contributors make no warranty, express or implied, regarding the accuracy, reliability, fitness for a particular purpose, or merchantability of this product.
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