FT232H Breakout – General Purpose USB to GPIO, SPI, I2C

The SmartElex FT232H Breakout is a USB-to-multiprotocol interface board that lets your PC directly control hardware using GPIO, I²C, SPI, UART and JTAG. It uses the FT232H chip with MPSSE, includes USB-C and a JST-SH Qwiic port for easy I²C connections and works at 3.3V logic.It is ideal for testing sensors, debugging SPI/I2C devices, hardware prototyping and automation directly from your computer—no microcontroller needed.

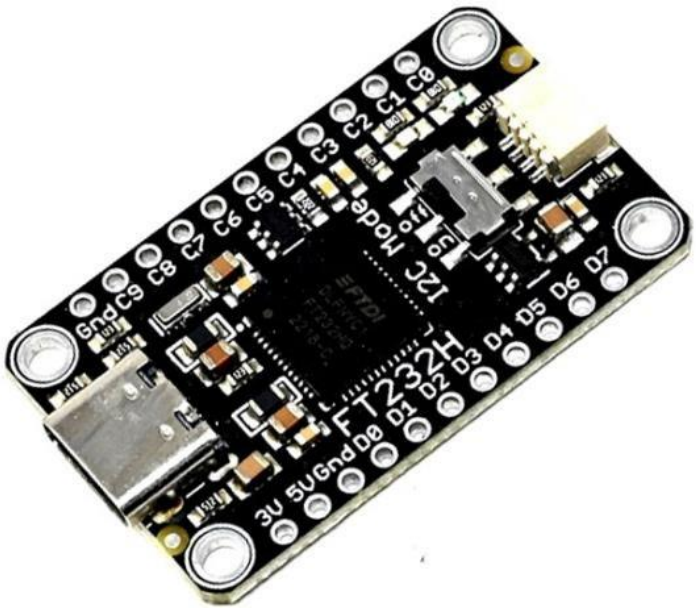
It is a powerful USB-to-multi-protocol interface board based on the FTDI FT232H chip. Unlike normal USB-to-serial adapters, this board provides a full MPSSE engine, allowing your PC to directly communicate with digital hardware without a microcontroller.

Key Capabilities

- **USB to GPIO** – Control digital input/output pins directly from your computer.
- **USB to I²C** – Communicate with I2C sensors, modules, EEPROMs, etc.
- **USB to SPI** – Interface with SPI displays, flash chips, ADC/DAC modules.
- **USB to UART** – Also works as a standard USB-Serial converter.
- **JTAG support** – Useful for debugging and programming devices.

Connectivity Features

- **USB-C port** for modern PC connectivity
- **JST-SH (Stemma QT/Qwiic compatible)** for plug-and-play I2C devices
- **Breakout header pins** for all FT232H signals
- Supports **3.3V logic** with onboard regulator



❖ FT232H Breakout – Wiring

- **5V** – Direct USB 5V output.
  Do NOT draw more than ~400–500 mA to avoid damaging your PC's USB port.
- **GND** – Common ground for the FT232H and your external circuit.
- **D0–D7 (ADBUS)** –
  - Used for **UART**, **SPI**, **I²C**, and other MPSSE serial protocols.
  - Can also function as **GPIO** (input/output).
- **C0–C9 (ACBUS)** –
  - Mainly **GPIO pins**.
  - **C8 & C9** cannot be controlled directly in software; they require **EEPROM configuration** to change their function.

❖ FT232H – Serial UART

- The FT232H works **like a USB-to-Serial (UART)** converter by default.
- Safe for **3.3V and 5V** serial devices (Arduino, Raspberry Pi, BeagleBone etc.).
- Used to communicate between your PC and another serial device.

UART Pin Functions (D0–D6)

- **D0 – TX**
  Sends data **from FT232H → device**
  (Connect to device **RX**)
- **D1 – RX**
  Receives data **from device → FT232H**
  (Connect to device **TX**)
- **D2 – RTS** – Optional hardware flow control
- **D3 – CTS** – Optional flow control
- **D4 – DTR** – Optional RS-232 control signal
- **D5 – DSR** – Optional RS-232 control signal
- **D6 – DCD** – Optional RS-232 signal

Most commonly used pins :

🟦 **D0 (TX)**
🟦 **D1 (RX)**

The rest are needed only for **flow control** or special RS-232 requirements.

❖ FT232H USB Serial Drivers

1. Driver Requirement

- Python 3.14
- Zadie
- FTDI CDM Driver
- PyFtdi
- PyUSB
- PySerial
- libusb-package
- PuTTY

2. OS Support

macOS

macOS Mavericks and later include FTDI drivers by default.

- Usually no installation required.

Linux

- Linux kernel 2.6+ supports FTDI chips.
- Ubuntu 12.04, 14.04, and all modern distros work automatically.

Windows

- Windows usually installs the driver automatically.
- If not, you must install FTDI VCP drivers manually.

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3. Downloading FTDI VCP Driver

Download link (official FTDI):

) https://ftdichip.com/drivers/vcp-drivers/

Select:
Windows → VCP → Setup Executable (.exe)

Windows Installation Guide (Full Steps)

Mode 1 – FTDI VCP Driver

Use Windows 7 / 8 / 8.1 / 10 / 11 only UART.

- UART
- COM Port

Important Note

- Only one driver mode can be used at a time.

	Driver	UART	GPIO	I²C	SPI
1.	FTDI VCP	✓	✗	✗	✗
2.	WinUSB	✗	✓	✓	✓

Mode 2 – WinUSB Driver

Used for:

1. GPIO
2. SPI
3. I²C
4. JTAG
5. MPSSE
6. PyFtdi

- **Driver**

  WinUSB

- **Device Manager**

1. Universal Serial Bus Devices
2. Single RS232-HS

- **WinUSB Driver Installation Using Zadig**

1. The FT232H requires the **WinUSB** driver to use **GPIO, I²C, SPI, JTAG, and MPSSE** through the **PyFtdi** library.

Note:

- FTDI **VCP Driver** → Used for USB-to-UART (COM Port).
- WinUSB **Driver** → Used for GPIO, I²C, SPI, and other MPSSE functions.

Prerequisites

Before installing the WinUSB driver:

- Download the latest **Zadig** application.
- Connect the FT232H board to the PC.
- Close all applications that a re using the FT232H (PuTTY, Arduino IDE, Python scripts, etc.).

Step 1 – Download Zadig

Download Zadig from the official website:

https://zadig.akeo.ie/

Step 2 – Run Zadig

1. Right-click **Zadig.exe**
2. Select

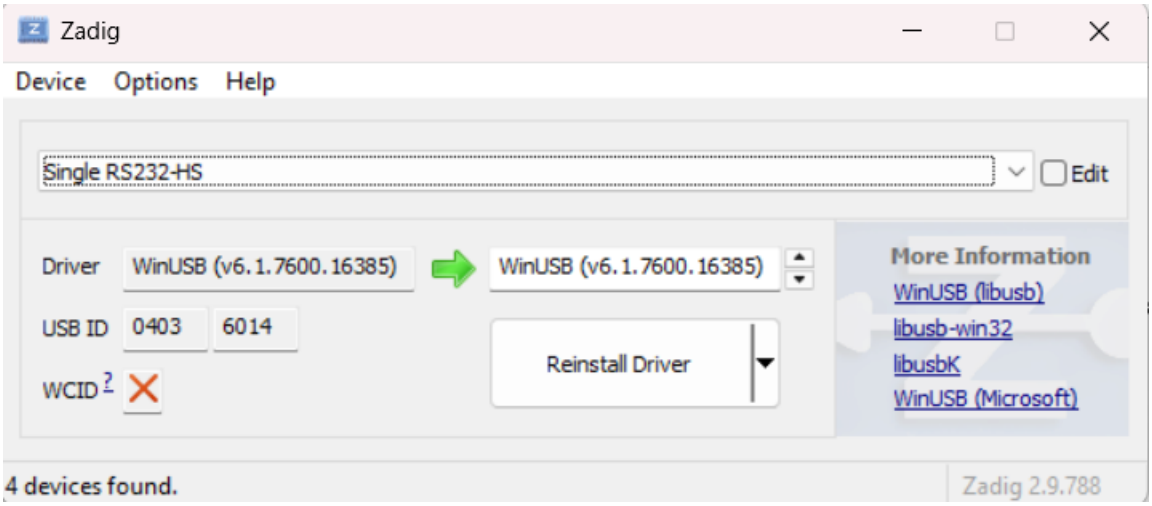
Step 3 – Display All USB Devices

From the menu bar:

- Option
- List All Devices

Step 4 – Select FT232H Device

- Single RS232-HS
- VID: 0403
  PID: 6014



Step 5 – Replace Driver

- Replace Driver

Step 7 – Reconnect FT232H

1. Unplug the FT232H.
2. Wait 5 seconds.
3. Plug it back into the USB port.

Step 8 - Python Installation

CMD

- py –version
- Install Required Python Packages
- py -m pip install pyftdi
- py -m pip install pyusb
- py -m pip install pyserial
- py -m pip install libusb-package

Step 9 – Testing

1. FT232H_Detection.py

   CMD

   Detect FT232H Device

   CMD: py FT232H_Detection.py

2. GPIO_Test.py

   Verify GPIO output.

   D0 GPIO LOW, HIGH

   Run CMD: GPIO_Test.py

3. I2C tmp102_read.py

   Read TMP102 temperature.

   Run CMD: tmp102_read.py

   Temperature: 28.4 °C

   Pin out use D0 and D1.
