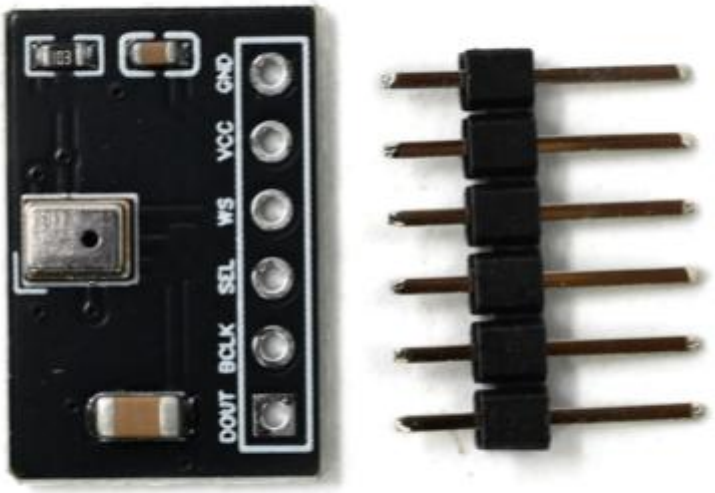
SmartElex – I2S MEMS Microphone Module



📌 Overview

The SmartElex I²S MEMS Microphone Module is a **digital microphone** that outputs audio data over the **I²S (Inter-IC Sound) interface**, which means the audio is already digitized on-board — **no external ADC needed**. It's compact, low-power, and suitable for voice/audio systems, AI/voice recognition, recording, sound analysis, and more.

📦 Key Features

✓ Digital audio output via I²S — ideal for direct interfacing with digital audio peripherals on MCUs/computers.
✓ Based on a **MEMS microphone sensor** — good stability, low noise, and reliability.
✓ Omnidirectional sound capture.
✓ Compact form-factor for easy integration.

🔌 Connection / Pinout (Typical I²S MEMS Microphone)

Most I²S MEMS mics (including SmartElex) use a similar pin convention:

Pin	Function
VDD / 3.3V	Power supply (typically 3V3)
GND	Ground
WS / LRCLK	Word-select (Left/Right channel indicator)
SCK / BCLK	I²S bit/serial clock
SD / DOUT	I²S serial data output

Note: Some variants may have a **SEL/LR** pin to fix the mic to left or right channel. First check the exact module documentation.

🔧 Typical Electrical Specs

(Exact specs depend on the specific part inside the module, but typical values for these mic modules are similar to standard I²S MEMS parts):

- **Power Supply:** ~1.8 V – 3.6 V (often designed for 3.3 V)
- **Interface:** I²S digital audio
- **SNR:** ~60-65 dB (typical for MEMS I²S mics)
- **Frequency Response:** ~50 Hz – 20 kHz (varies by design)
- **Omnidirectional pick-up**

🧠 How It Works

Unlike analog microphones that output voltage proportional to sound pressure, **I²S MEMS microphones digitize the audio signal on the chip and send frames of digital samples** over the I²S interface. The host (MCU or DSP) provides the clock signals (BCLK + WS/LRCLK), and reads the incoming serial audio data stream.

🎛️ Typical Usage

You'd typically connect it to an I²S-capable microcontroller (e.g., ESP32) like this:

- **VDD → 3V3**
- **GND → GND**
- **SCK/BCLK → I²S Bit Clock pin**
- **WS/LRCLK → I²S Word Selection pin**
- **SD/DOUT → I²S Data input pin on MCU**

Then configure your MCU's I²S peripheral to receive the digital audio stream.

🛠️ Example Applications

- Voice recognition & AI audio systems
- Digital audio recording/streaming
- Smart home sound monitoring
- Bluetooth audio input